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SOME ECONOMIC FACTORS IN MODERN LIFE

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Some economic factors in modern life.

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SOME ECONOMIC FACTORS IN MODERN LIFE

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SOME ECONOMIC FACTORS IN MODERN LIFE

BY

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Fellow of the British Academy

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PREFACE

COMPREHENSIVE works on the Principles of Economics must necessarily be few and far between—perhaps fewer and farther than ever, with the increasing complexity of the science—and they are best written by the professorial economist who can make them the main work of his professional life. A great synthesis is demanded anew for each generation—Mill, Marshall, Pigou. But the development of the subject lies to an important extent in specialist works upon such particular aspects as Currency, Foreign Trade, Demand and Supply, Taxation; or, to an even greater extent, in still more concentrated treatment of yet narrower areas. All of these, however, proceed from the centre of economic theory outwards. But the realistic economic life meets all the streams of practice, custom and idea impinging upon it, infiltrating it at a score of distinct points, and conditioning and modifying it as "Economics." Why not sometimes change the direction of study, and drift *from* outside on some of such streams *into* the heart of the economic territory?

It is a natural habit for one who, thinking as an economist, is called upon to touch different aspects of modern thought and practical affairs with more or less firmness and certainty in daily life, to think of them as economic factors, and to try to determine their influence on economic and social life. His friends (and enemies) in those different fields of activity conspire to afford him compelling opportunities for expressing such thoughts, in addresses and lectures on formal or official occasions, and some of these efforts seem to have, if they do not deserve, an appeal beyond their lawful occasions. Hence this collection. Perhaps the most important factor to which I have given

continuous thought is the influence of religious and moral principles in modifying the economic life, and the Beckley lecture on " The Christian Ethic as an Economic Factor " contained my views upon that subject. But it has already expanded itself into a separate book, which has had a wide sale, and there is no justification for including it in this volume. My ideas upon Taxation as an economic factor were for the past three years continually being elaborated, but I threw them into the common pot of the Colwyn Committee's Report, and I hardly know now for which parts of that report other people were responsible, and how much I could claim to have originated myself. Certainly I have not yet much that is different to say about it. Another important modern economic factor to which I have had to give attention, " Reparations," I have dealt with in a published Report to the International Chamber of Commerce. Having thus accounted for the omission from this volume of any treatment of three most important influences upon economic life to-day, I can now only express the view that those factors actually included here are all critical influences in human and social affairs at this stage, worthy of serious attention and study from every angle by all who are trying to re-think the world of ideas, preliminary to sound rebuilding of the world of practical life, and I offer this as one economist's contribution to that study.

I acknowledge, with thanks, the permission of the *Economic Journal* to reprint Chapter II. Several of the other chapters have appeared in pamphlet form, but as here reproduced there are some substantial modifications and additions.

I have, too, to thank Miss Katharine Wickett, B.A., for her work upon the proofs and index.

J. C. S.

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SOME ECONOMIC FACTORS

I

AESTHETICS

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I

AESTHETICS [1]

If I use *aesthetics* as a general term to cover historical, antiquarian and archaeological interests, as well as natural beauty and amenity, and *economics* as a term to cover the getting of *material* welfare—either satisfactions actually measurable in money, or put in the balance as an object of human desire with which money objects may compete—then it would be roughly true to say that in popular esteem they are fairly incompatible. For coal-getting and factories have spoilt natural beauty, and many objects of great antiquarian interest have been sacrificed to town extension, wider streets, rail and road highways. So-called non-productive uses have had to give way to hard profit considerations, and age-long timber has been felled to pay off the mansion mortgage and meet the rates. Moreover, did not Ruskin, the apostle of aesthetics, continually fulminate against every advance of the materialistic age of smoke and steel? And do we ever find sound men of business indulging in such sentiment as aesthetics involves, or antiquarians and ecclesiologists behaving as men of affairs with business instincts? Is not getting a living a necessity, and studying unproductive antiquity or landscape a luxury? Ought we not to love the grey and stern evidences of man's conquest of the material more than the picturesque evidences of his stagnation?

Truly economics *seems* the implacable enemy of aesthetics.

[1] An Address to the Birmingham Civic Society, on Sept. 29th, 1927, under the title: "Aesthetics and Economics in Harmony and Conflict." The immediate occasion was an invitation by the Society, following a decision by the L.M.S. Railway Company, to save "Stratford House"—a sixteenth-century half-timbered building in Birmingham—from demolition to make room for the extension of railway sidings.

Truly economics seems to *owe* nothing to aesthetics. But is it really true that they are mutually exclusive and incompatible—that as a man becomes more aesthetic he must be less economic, and *vice versa*—or that attention to aesthetic welfare must be at the expense of economic welfare?

I wish to affirm my entire conviction to the contrary, and to say that indifference to the aesthetic will in the long run lessen the economic product; that attention to the aesthetic will increase economic welfare. After that I want to analyse briefly the practical consequences. I have heard that the first writer on systematic political economy was a Greek architect, Hippodamus of Miletus, in the fifth century B.C., but I cannot vouch for his economics, and his architecture may have been highly utilitarian for all I can tell. But there must have been others between him and Ruskin who dabbled in both. I make three broad economic assertions, which I shall not attempt to prove here, but the immediate aesthetic *consequences* of which will form my main theme:

First Proposition

Economic conditions are obviously, and will be, profoundly affected by the social institutions men *select*, and by their political framework. If not, then capitalism, socialism, individualism, communism and bolshevism must be economically equal—which is absurd. Men's *selection* depends upon their intellectual equipment of facts and logic and their moral philosophy of life. This equipment and philosophy are impossible to any high standard without a developed geographic sense and an historic sense. An historic perspective is greatly assisted by visible and objective signs and reminders. The care of such signs comes within the field of practical social aesthetics. In short, the historic sense in a democratic society has an ultimate direct influence upon the economic attainment of that society in two ways: (*a*) as an ingredient or factor in judgment on public affairs, and (*b*) as a personal moral incentive. My first theme is the aesthetic contribution to a sense of history.

Aesthetic Contribution to a Sense of History

I think that a popular sense of history and perspective is best, or mainly, secured by objective interest, or an appeal to the eye and the touch. Only a minority can long remain interested in abstractions and descriptions. Dotheboys Hall "winder-cleaning" methods were a system good in conception but faulty in execution.

Actuality is Essential to Knowledge which is the Basis of the Historic Sense

It is an almost universal experience that, without concrete embodiment and objective illustration, the average mind cannot for long retain abstract ideas or ideals and interests. Mere book-learning is the possession of a minority, but even those of us who can live with abstractions, who can browse perpetually in ideas and sentiments, acknowledge readily the value of a sight of realities in correcting impression, and especially in giving new impetus to interest and intellectual curiosity and liveliness.

The historic sense has some analogy in the geographic sense; both are highly necessary to sound judgment of complicated human affairs. This distinguishes the present civilised age from less sophisticated ones. Space and time are both elements which distinguish adequate powers of judgment to-day. Now the sense of space, or the geographic instinct, may be partly obtained in these days by the reading of books of travel and description, the higher uses of the cinema, of broadcasting and the like. But nobody would declare that to sit at home and read a guide-book and look at views of distant parts was equivalent to having a holiday. Travel, in its sense of actuality, adds enormously to all knowledge that can be gained in those other ways. Now, in a way as real, but less self-evident, objectivity helps the sense of time, and particularly of development. Can you imagine anything more calculated to restrict the mind in both ways than the life of a Middle-Westerner, with hundreds of miles around him of little towns like his own, with no tradition in his village popula-

tion, and not even an ancient parish church to remind him of the roots of history, or to tell him in his pensive moments that there were ever any times other than his own?

I well remember in 1920 crossing to the States with a large company of Middle-Western Americans, who were at that time greatly excited about the Irish Question, and, being one of the few available Britishers, I was constantly asked to explain the Irish Question to them. In their comments and questions they baffled me completely, because whole centuries of historical incidents in this story were crushed into one flat identical plane, and some remark that I made about a happening within the past month would be countered by some retort as to what Oliver Cromwell did, or the Fenians, or Balfour in the eighties. All sense of relativity and perspective was completely absent. From that kind of mentality obviously no proper judgment of such a question, which requires both the historic and geographic sense, was possible. As Dr. Whitehead says, "Men can be provincial in time, as well as in place."

The interaction between sight and thought in giving birth to knowledge, and to that vital interest in the context and panorama of human life which is the most precious possession of content and the firm bulwark of character, is nowhere better illustrated than in the study of architecture. There is no branch of knowledge in which an investment of time by the fireside leads to quicker and more substantial dividends in the open. Yet who is likely to ponder books of diagrams and sections, or even picturesque views, if interest and desire are not quickened by the challenge of a treasured tower? Even the most intense observation and liveliest pleasure in the sight of a cathedral, if there is no mental background of book knowledge to preserve it, fade in a few weeks into a confused recollection of magnificence and a vague impression of size. That impetus to growing interest, the power of comparison with other examples, if based on pure recollection of this kind, is altogether impossible. But a little careful study of the

characteristic features of style, and particularly the less picturesque and drier study of sections of mouldings, in door and arcade arches, in string courses and dripstones, at once transforms the hazy impressions into scientific data, meaningless chaos fitting into a clear mental picture of intention and development that the memory can carry over long periods of years and to the ends of the land. To him that hath shall be given. The truth is that we mostly only see what we have been taught to see or look for. Teaching about what to see or look for does not long survive in the mind if it has no practical exercise. The child called "interest" is born only of the complete marriage of knowing and seeing; there is no parthenogenesis here.

The popular study of mediaeval ecclesiastical architecture is, I believe, growing in general estimation. Nothing leads more directly into the humanities. A village church is at once a monument exhibiting civil and religious history, social development, economic conditions, folklore, ecclesiastical change, geology, heraldry, art craftsmanship and evolution of beauty, relativity, progress in mechanics and engineering, and a problem to be unravelled worthy of all the deductive reasoning of the highest detective art. Hardly a province of knowledge is untouched or faculty of the mind unused when you ask your questions and read your answers. Pass round this church and take my catalogue of subjects in order: Civil history: Why that recumbent knight with his feet on the lion, and this one with the hound? Religious history: Why those empty niches, that pulpit of pattern so different from the screen? Social development: Why that airy, lighted chapel? What is the punning rebus in the boss for someone newly-rich in the woollen trade? Why that stone bench around the wall? Economic conditions: Why this profusion of fine sculpture or this wealth of woodwork? Folklore: Who can read that quaint pictured story on the font and tympanum? To what end was the "storied window richly dight"? Ecclesiastical change: Why the stairway in the chancel arch, the Easter sepulchre? Geology: Why

this quartered and decorated flintwork? Whence this marble shaft? Heraldry: What is the status of that fencéd knight with shield on shield? Craftsmanship: How could men have chiselled and human skill have undercut those lovely capitals? Evolution of beauty: Could such naturalism ever have evolved from conventionalism? How striking is the unbroken sequence of window tracery, from the mere hole in the wall to the intricacy of the late Geometrical! Mechanics and Engineering: Why were those early efforts at vaulting a failure, leading to that special buttressing? The detective, deductive instinct: How has this ground plan evolved in such a sequence? By what demands of space or style can we account for that mixed arcade of varying dates?

Actual sight of historical objects is thus an essential gateway to knowledge, on which the historic sense is based.

But for those who have knowledge already, actuality always makes it live more vividly and become an essential and not an accidental part of their mentality and outlook. It is not merely a question of a sentimental love of ruins. The mellowing, softening touch of years, the weathering of grey or fawn stone, the gentler harms and damages of Time's remoteness and age-long experiences, are not all enough to give ultimate worth. They have their own directness of expression and individuality, and complete fitness of means to ends—a spontaneous harmony with their surroundings that would not disappear even if we saw them new and sharp. This was got by a natural appeal, without great professional study, or sophisticated tradition, but aiming directly at serving a purpose. "As soon as pure artifice thrusts itself before the law of practical provision, it is no more part of true architecture than our clothes are part of our skin. This is the firm principle of the best we can find, for example, in Tudor domestic architecture." [1]

Actuality turns Knowledge into a Dynamic Historic Sense

To handle the authentic history itself is to get solidity into perception—no longer a painted scene, or the make-

[1] S. E. Castle, "Domestic Gothic of the Tudor Period."

shift of sham planes, but the rounded feel of objects, in a perspective that we pass *into*. In my study of taxation I read of the hearth tax of the Restoration, and the hated chimneymen, and the joyous repeal, and the succeeding window tax. It is graphic, but it does not seize me with actuality. Then in the Record Office, searching for the distribution of a family name in a county area in the seventeenth century, I unroll the unwieldy parchments, parish by parish—a veritable household directory; or more, because I can see the importance of the dwellings. There is one leaving the house, Widdow Joliffe, into which moves that rising young carter, Spooner. Where is the "widdow"? I find her now in the neighbouring parish, gone to live next door to her son. Last year's parchment roll showed that abode she now takes as void and falling down—some good building has since been done. But "widdow" is now marked "poore" and pays no tax. Here, legible, as if written yesterday; there, whole parishes torn, burnt or missing; again pages hardly readable in that cramped evolution between the German script of James I and the modern English cursive. Does not my hearth tax live? Or its aristocratic parent, the subsidy, and those neater, more exiguous rolls and their selecter gentry, charged for their lands and their goods? Will someone two hundred and fifty years hence turn over the pages that I, as fledgling income-tax surveyor, wrote in the year that Queen Victoria died, and observe that John Jones, Butcher, £250 (abated £160), in my view "wants watching," or "is acquiring property," or "lives in £40 house—other income"?

Then, again, I know all about the Plague, and the in-and-out upheavals of those Civil Wars, and the disease and death and depopulation. But I never live in it to feel it as my own veritable history, until, sitting in the little vestry with the old iron safe open beside me, I turn over the frayed leaves of the parish registers of the village church, watching the clock, with the patient custodian, the rector, growing less vigilant and more trusting of me every hour. I pass year after year of burials at a rate of five minutes for

a year and calculate I shall be through with my task in half an hour; when suddenly the years lengthen out into solid blocks of many pages for each. What has happened? I have plunged into those dread plague years and they are telling me their story in a way that makes a *difference to me*. That is history indeed. Then here are those customs of Elizabethan England. There is, for example, "Roger Shepherd, son-in-law to Nicholas Wollands, was slain by a lioness which was brought into the town to be seen of such as would give money to see her. He was sore wounded in sundry places, and was buried the 26th day of August." Then the shameless lack of reticence of these parish records, carrying a social blunder, that was hid from inquisitive neighbours then, to the eyes of the merely curious searcher now. Again! That's the second "baseborn" child to "Mary" with the quaint surname, in these two pages.

No one has really lived with his ancestral England unless he has sat in that basement room at Somerset House and handled those vast brown volumes of wills, and painfully deciphered the cramped abbreviations, and slowly spelled out the social conditions of the sixteenth century in the family loves and hates, the petty proud possessions of beds and bolsters and coverlets, and the "oak chest that is in the chamber where I lye." I know all about the decline in the value of the monetary unit since the Middle Ages, and sheep costing fourpence. But when a forbear of my own makes an elaborate bequest to all his nieces and nephews of five shillings each and a silver ring, knowledge yields to conviction. I read the inventory of the wealth of one who bore arms, and was visited by the Heralds, and paid subsidy, and was no end of a person in his day, and then I know what relativity in the standard of life means, and contentment being no mathematical function of possession. Indeed, any authentic document is the true Time Machine, and the centuries take on the quality of space traversed.

As a mere habit of collecting, rarities and first editions mean little to me. I can study the evolution of economic doctrine as quoted in any modern text-book or reprint, and fully comprehend it. But in that brown old volume,

with its ancient form of type and its veritable individual survival, William Petty or Josiah Child or Thomas Mun looks straight at me, and I actually *see* the evolving of human opinion about gold and the balance of trade, with that kind of reality in the mind like the close, rare clearness of the landscape through a lens on the right kind of evening. My own faculty for actualising by contact is, no doubt, limited; others possess it elsewhere. I have not learnt to people the past with the touch of mediaeval armour or a halbert in a museum. But long familiarity with fourteenth- to sixteenth-century buildings gives me the mason's mind and the whole panorama of his times, with the growing power of the squire, and the meretricious new directions of money-making, and the blistering silences of the Black Death; gives a doubting wistfulness that someone five hundred years hence might feel about what I am doing as I feel about this.

One more example, from my own range of interests, of the power of actuality. I love biography. I know, of Palmerston, all the facts of his practical, quixotic petulance about the bad handwriting of his Foreign Office subordinates. But from my autograph collection I hold in my hand the veritable and authentic writing—February 9th, 1849: "My dear Ponsonby: Your attachés put me out of all Patience by the paleness of the ink in which they write out your Dispatches. Pray give them my compliments and say I have put all at the Bottom of their respective Lists, and if they do not mend their ways, I shall be obliged to send you in their stead another set who will pay more attention to writing that which can be read. Yrs. sincerely, Palmerston." This is a thing that lifts it out of books and makes it actual—provides the very continuum of history in my being. Or again, Palmerston at twenty-five, at the War Office, can be seen in Philip Guedalla's graphic pages. But I make the old War Office stereoscopic when I hold in my hand the account headed "State of allowed charges of the 15th Regiment of Foot from the 25th December, 1797, to the 24th December, 1798, both days inclusive." It is given in detail. But the accounting

in finality seems to be indeed leisurely when Palmerston signs and certifies it on August 26th, 1812, fourteen years after the date to which it relates.

Yes, if a wider possession of historical perspective is essential to balanced judgment on social evolution—and this is essential to the wise development of democratic institutions, and thus to sanity in economics—then objectivity and actuality are the main gateway to that sense of history we should value so much. Every illustration, in a cottage, or manor house, or abbey, or tithing barn, or keep, is a popular educator leading, not far away, to better economic insight. But even the mere stone marking a battle site or a decisive event keeps that event potentially active as a point in the long vista, even to a whole charabanc of Jerusalem-builders in a green and pleasant land. Every tablet marking the dwelling-place of a great thinker or doer, not merely makes his name imperishable, but keeps alive that the thing he *did* had to be begun and done, and was not always a part of the scheme of things. So things to-day are evolving that some day will be solid to the touch as the oldest hills, and some man we sneer over is becoming great enough in the doing for a plaque of his own when we have ceased to be curious.

The Historic Sense and Character

For I set great store by objective actuality, not merely because it creates a sense of history, the base of sane judgment of things relative, and of economic commonsense in arranging them, but because that same historic sense is the best nursery of resolve, selflessness and public spirit. Ruskin said: "Each generation will only be happy or powerful to the pitch that it ought to be in fulfilling these two duties to the Past and Future. Its own work will never be rightly done, even for itself—never good or noble or pleasurable to its own eyes, if it does not prepare it also for the eyes of generations yet to come. And its own possessions will never be enough for it, and its own wisdom never enough for it, unless it avails itself gratefully and tenderly of the treasures and the wisdom bequeathed to it by its ancestors."

Christopher Wren laid stress on the public spirit which objects of interest and architectural beauty could create, a sort of communal *esprit de corps*. "Architecture has its political use; public buildings being the ornament of a country, it establishes a nation; draws people and commerce, makes the people love their country, which passion is the great original of all actions in the Commonwealth. The emulation of the great cities was the true cause of this greatness."

Character and purpose ought to be made greater by a sense of social evolution and betterment, creating firm resolution and pride that in the whole time sequence this age alone should not appear barren. This evolution sense is fostered by recognising that past forms are objective indications of past needs and past states of life. In domestic architecture there should be vivid human interest. For its revelation of daily life ought to appeal to a wide range, yet it seems to be little understood or appreciated. If we could be natural about it, and realise that it expresses, not so much the ideas of professional architects as the character and wants of a people from whom we have ourselves developed, it would invade the sentiment of ordinary folk like any domestic or homely reminiscence. First we must at least do as well. "Many of us are impelled to inquire into the secrets which make for the happy composition of these venerable buildings, because we feel that, far from our having outlived the example they set, there is some doubt as to our living up to it." [1]

Secondly, we ought really to do better ourselves. It may be trite to say that "lives of great men all remind us, we can make our lives sublime," but without the dwelling and the memorial, the statue and the plaque, the great majority would have little stimulus to know anything of those great lives. But even the most casual, seeing a group taking an interest in such an object, will inquire: "Well, who was the bloke anyway?" and have a fleeting glimpse of some human achievement which he had vaguely thought was always with us, or dropped from the skies.

[1] S. E. Castle, *op. cit.*

Second Proposition

Aesthetics and Production

My second economic assertion is that maximum economic good is not synonymous with maximum production unless the production is a balanced one—balanced in accordance with an all-round exercise of human faculties. Man is a more productive economic being if all his faculties are exercised in work and leisure in a balanced way, than if he is entirely one-sided and specialised.

The aesthetic is, then, an essential element or factor in a balanced economic activity or producer. Here I mean that leisure properly spent, in a change of interests, in simple and not always feverish interests, is a tonic to the nervous system. A wider range of interests as a hobby or holiday confers elasticity upon the man or upon special activities from which he rests. A focus of interest stimulates interest, and an historic building may often be such a focus. It usually involves some travel and effort, and as a definite object gives a brief stay from aimlessness. The preservation of beautiful areas and natural scenery contributes to such mental rest, and directly to physical fitness, both along psychological as well as physiological lines. This obvious aspect I shall not labour, for we are getting more and more alive to the necessity for open spaces and lungs in our great town development, and while this may act purely through the physical, sheer beauty and natural sublimity are such a reaction to the ordinary as to operate through the mental and psychological nature of man.

Third Proposition

Aesthetics and Economic Consumption

My third economic proposition is that maximum economic production does not lead necessarily to maximum economic satisfaction. Economic welfare depends upon whether the production is of such things, in balance, as give greatest total utility or satisfaction in consumption. Man does not live by bread alone. Production is only a means to an

end, and we must look to the end for the economic answer. Enjoyment or "consumption" of the aesthetic products follows the same marginal laws, or considerations, as "consumption" of food, clothing, sport, travel and speed. It may be latent, and only assert itself as an economic good on being awakened, educated or fed, like many other economic tastes. We do not secure an optimum economic position by remaining primitive, primeval or unsophisticated in our faculty for appreciation and enjoyment. My third theme, then, is the aesthetic as an ingredient or factor in maximum human enjoyment.

The economic doctrine of margins shows how man applies each unit of *general* power-to-satisfy-wants that he possesses to particular wants or satisfactions, so as to give maximum marginal satisfaction. Having a second pair of boots, a third has less attraction than a second hat, and having power to supply a third hat, a visit to the theatre gives greater pleasure. A continual process of substituting one line of satisfaction for another is automatically and half unconsciously pursued by individuals. But all progress and civilisation have involved not merely the full satisfaction of old or primitive desires, but also the development and satisfaction of new. The new ones arise from social emulation, but also by education and cultivation of finer instincts and desires. The supplying of their wants gives a satisfaction keener, fresher and more varied, in proportion as they belong to the less ordinary sides of our nature. To develop such cravings by culture, and then to satisfy them, is to maximise economic welfare on the side of consumption of wealth. The man who spends £500 a year in satisfying the first range of wants to the point of satiety, according to the economic doctrine of margins, gets less maximum economic value than he who spends £400 on that range and £100 on another range of natural, if acquired, tastes. Not to be priggish, or to put too fine a point on it, a full and varied life, with elements of sentiment and spirituality, is the highest economic life, because it gives the maximum of satisfaction. The community that refrains from the temptation to devote all its resources to assets productive

of money profits or business ends, and devotes part of them to assets productive of other kinds of satisfaction, is economically the richer. Once admit the latter to the title of economic goods, and another issue is clear. If it is an economic duty to *produce* aesthetic wealth of this order, it must be an economic duty also to *preserve* what we have. Ruskin said: "Wherever you go, whatever you do, act more for *preservation* and less for production." He also declared: "It is the duty of all good economists to proclaim continually that our respect for the dead is not really shown by great monuments to them which we build with our hands, but by letting the monuments stand which they built with their own." [1] The act of preservation is often, too, the act of education, and the development of the instinct which shall make the thing preserved more valuable. When Clutton Brock discusses the three elements of the Ultimate Belief, the moral, the intellectual and the aesthetic, he says:

"In education the absolute value of the aesthetic activity should be recognised, and that not merely in relation to works of art, but also in relation to the universe. A boy should be made to understand that when he perceives the beauty of anything, he is exercising an activity of the spirit, whether it be the beauty of nature or the beauty of art. He should be taught that to see beauty is not merely to amuse yourself, but to be aware of a glory of the universe, and that it is an end of life to be aware of this glory.

"Our whole civilisation suffers both morally and intellectually from the suppression of the aesthetic activity. Unless we exercise our aesthetic activity the universe is not glorious to us. Science is a discovery of arid fact, and duty obedience to a set of rules. When Christ told His disciples to consider the lilies of the field, He assumed that they had seen their beauty, that they had exercised their aesthetic activity upon them. If they had not done so, His statement that Solomon in all his glory was not arrayed like one of these would have been meaningless." [2]

We are only just beginning, in our new era of civilisation, to recognise that more and more purely material progress, unless it is progressively aerated by finer appreciations and

[1] "A Joy for Ever," II. [2] "The Ultimate Belief," p. 79.

artistic perceptions, merely means a suffocating mass of commodities. Instead of four objects in place of two, far better to have two that are finer and higher examples of craft. Clutton Brock said: "Our whole society suffers from a lack of values, from a bewildered worldliness that is not even content with itself. . . . Love beauty for its own sake, and you will love it better than luxury, which you only value because it gives you comfort or heightens your importance."

If I have satisfied you that from three points of view objects of natural and historical interest have an important economic value, I have established that it is short-sighted economic policy not to foster and protect aesthetic values. So when they collide, or conflict, and you have to decide between a new street and an ancient house, you are not necessarily putting business against sentiment, but one direct business advantage against another business advantage, less direct, but no less ultimately real. Where the community has charge of both sides of the account, it is a clear duty to weigh these economic alternatives. But more often it is an individual interest that will *gain* the direct material profit, and the community, not the individual, who will *suffer* the indirect material loss thereby. So we get the actual conflict between private economic gain and public economic gain, and not between private economic gain and public sentimentality. It becomes often a high form of socialism for the community to relieve the individual, if necessary, of some of the private loss which communal advantage must involve. The conflict does not become real with movable objects which can be collected in galleries and museums. It is only actual where fixed space is occupied by buildings, beautiful, ancient or notable, and by natural scenery, which get in the way of some other type of material development, such as wider streets, new suburbs or a conveniently situated power plant. These may not necessarily satisfy mere private ambition or cupidity, but may be highly important communally.

It is a curious fact that a recognition of the worth of such objects of aesthetic value as buildings dawned at the

time of their greatest peril through industrial development, but lagged behind. The Gothic Revival came in soon after the Industrial Revolution—it blundered through a period of false ideals about restoration, and its spirit was not catholic enough to protect many types of beauty and interest now considered valuable. So far as we can see, a passion for natural beauty is a modern development. Until the Naturalist school, coeval with the Industrial Revolution—Wordsworth, Byron, Shelley, and others—poets gave little genuine expression to appreciation of landscape. The literature of earlier times is singularly barren of praise for scenery that we now travel miles to see. Dr. Johnson's famous remark on the majestic aspects of Skye may have been typical of this blindness. Boswell, in his delight, pointed out "an immense mountain, and the doctor sincerely sneered, 'An immense protuberance.' He only cared for mountains in books, and even in books he did not care for them much." [1] At an earlier time even St. Paul "seems to have had little consciousness of natural beauties, for though he travelled through some of the finest scenery in the world, there is no reference to it in his letters and no figure of speech drawn from Nature." [2]

But at various times some writer has chronicled his feelings about the disappearance of worthy landmarks. Sir Thomas Browne said :

"'Tis time to observe occurrences, and let nothing remarkable escape us : the supinity of elder days hath left so much in silence, or time hath so martyred the records, that the most industrious heads do find no easy work to erect a new Britannia. 'Tis opportune to look back upon old times and contemplate our forefathers. Great examples grow there and are to be fetched from the passed world. Simplicity flies away and inequity comes at long strides upon us. We have enough to do to make up ourselves from present and passed times, and the whole stage of things scarce serveth for our instruction. A complete price of virtue must be made up from the centos of all ages."

Dr. Johnson's apathy for scenery did not extend to historic records. Boswell and he "cordially embraced"

[1] "A Summer in Skye," Alex. Smith, p. 140.
[2] "The Book Nobody Knows," Bruce Barton, p. 166.

when they landed on sacred Iona, and the Doctor exclaimed : " Whatever withdraws us from the power of our senses, whatever makes the past, the distant or the future, predominate over the present, advances us in the dignity of thinking beings." [1]

Those of us who know and appreciate the Prime Minister's character best, are aware that his love of rural England is not a mere compound of agriculture and farming pursuits, or country life and natural beauty, but is touched to emotion with the sentiment of its human records. This is clear in his recent appeal for the Society of Arts movement for the preservation of ancient cottages :

" Nothing is more characteristic of England's countryside than the cottage homes which, for century upon century, have sheltered her sturdy sons of toil. Who has not felt a thrill of admiration on catching sight of some old-world village round a bend of the road? The roofs, whether thatched or tiled; the walls, weather-boarded or half-timbered, or of good Cotswold stone—have been built with material ready to the hand of the craftsman, and, painted with the delicate pigments only to be found on the palette of Father Time, have grown amid their surroundings just as naturally as the oaks and elms under whose shade they stand. They are part of our country, part of our inheritance, part of our national life. No other country in the world has anything to compare with them. Ought we not, then, to be proud of them, to protect them—to do everything in our power to save them from decay? "

The appeal is founded on the following contentions :

(1) Certain elements of mediaeval society are brought out clearly only by these buildings—the preservation of the village is of vital importance as an historical fact.
(2) Good housing has been neglected for generations. We must recreate a new tradition linked up with the old.
(3) Many owners are unappreciative, or not well enough off to give effect to any appreciation.
(4) Thoughtless zeal has robbed us of treasures replaced with ordinary work.
(5) Public conscience is ready—an " intensive salvage scheme " is opportune.

[1] Boswell, " A Tour in the Hebrides with Dr. Johnson " (Oct. 19th, 1773).

The Society may contribute sums representing the difference between economic repair and the specialised repair deserved by fine examples of craftsmanship, or between a Government subsidy and the total cost of proper restoration, or purchase outright.

The Value of Co-operative Effort

The first important result of the work of a Civic Society is that it confers upon historic objects prestige and a sense of the precious. The man without knowledge would look upon some monument or Tudor architecture idly, and without any sort of arrested reverence, but seeing from a notice-board that it has been acquired by the National Trust or by the Society for Preservation of Ancient Cottages, or is in charge of the Office of Works, he at once realises that there are some people in the world, at any rate, who regard this object as precious. This tends to set up the process of attention and, therefore, of education, to which I have referred. He knows that though it means little to him, there must be something in it, because public attention has been practically—and financially—directed to it. Actuality in history is definitely labelled for him, and simple minds will readily yield allegiance or reverence where it is publicly asked for.

In the second place, the existence of such Societies means that public opinion of competent people likely to take practical interest in these matters is readily mobilised when occasion requires. This is a great advance upon trusting to mere chance as to whether some individual, with public spirit, is able to be influential enough to take action within the time—often all too brief—that is available. The people themselves are inclined to be too busy when we want them. As Sir Thomas Browne said :

> " We were hunted by the occasion, not catched the opportunity to write of old things, or intrude upon the antiquary. We are coldly drawn into discourses of antiquities, who have scarce time before us to comprehend new things or make out learned novelties." [1]

[1] Hydriotaphia.

Thirdly, such an Institution gains experience and knows the best lines of appeal and attack and defence; it does not have to feel its way, as a hastily improvised movement would do.

Fourthly, such a Society is able to achieve something like a uniformity of standard. A succession of *ad hoc* movements for particular ends may easily exaggerate the importance of some and underrate that of others, but the collective wisdom and experience of a body in constant being will level out these differences of judgment into a consistent line of policy.

Fifthly, these cumulative advantages should tend to give confidence and to enable the end in view to be attained with greater ease. After all, any individual appeal, however influentially backed, must come to many people who have no special confidence in that group for taking action, or even a prejudice against individuals, whereas an established reputable corporate body has all the prestige attached to impersonal Corporations, as such.

Sixthly, the known activities of such body may act as a deterrent, so that many propositions, otherwise outrageous, will not be raised, because it will be known that expert opposition can be expected.

Seventhly, what is everybody's business is nobody's responsibility. Vast English-speaking peoples in America and the Dominions look to this country to preserve the record of the ancient days before their own. If it becomes in all ways as modern as their own lands, it will cease to carry the traditions of a motherland, and cease to fascinate and haunt and recall. We have a trust to the bonds of Empire to preserve the distinctive characteristics of the Homeland.

Finally, vandalism for business ends will not pay, in the long run, even judged by economic tests.

The Perils of Popularity

Something needs to be done even after the treasured object has become a shrine, especially if an aspect of grandeur or dignity or mystery is an essential feature. A visit to

Cheddar Gorge after an interval of twenty years shows that the booths and stalls and paraphernalia of large-scale charabanc tourism can rob a scene of the very character that makes it famous. The incomparable mystery of Mont St. Michel fortunately just suffices to baffle the awful clutter and huddle of raucous and meretricious bazaardom that endeavours to stifle it. Public habit and opinion *can* be changed, with patience and right teaching: indiscriminate spitting, in this country at any rate, is fast vanishing; a sentiment about rubbish on the countryside is growing; some day, too, a sense of public dignity will surround the scenes of natural beauty and shrines of ancient life—else, could they speak, they might prefer the old-time neglect to the over-vociferous popularity of later days.

Conclusion

In my remarks I have admittedly dealt almost entirely with preservation rather than the exercise of civic alertness over new production—new works and achievements of credit and beauty. I have done so because it is much easier to arouse public sympathy for doing a new work with credit to a town than it is to defend some piece of antiquity which stands in the way of a supposed improvement. But we have little enough left, and must hasten to protect it. And important work has still to be done in forming judgment on new matters. Professor Lethaby has said:

> "Except for a hundred or two of buildings, London needs to be rebuilt from end to end. No writer on Economics has yet told us what are the limits to expenditure on public arts, whether a beautiful city is an investment or an extravagance. The modern political economy of quantity should be corrected by a political economy of quality."

Before a business project can be effectively launched it has to be controlled by a number of factors, or defer in varying degrees to them. It cannot ride roughshod over the physical conditions of land-contour, existence of streams, climate, customs of decency, ancient rights, trade conventions, even though over-riding any one of these might make

its way easier and more profitable. But the limitations are recognised and accepted. It is time that public opinion added to the given circumstances to which business development must necessarily accommodate itself certain standards of external beauty and the preservation of all objects of historic value and monuments of our national life.

II

INHERITANCE

II

INHERITANCE[1]

I. Introduction

It will probably not be disputed that one of the fundamental institutions of our modern life which is likely to come under criticism and challenge in the next twenty or thirty years is that of Inheritance. In the first place, it is considered to be inextricably bound up with the inequality of incomes and wealth; this inequality is said to be an offence against social justice; and this offence, in turn, is said to be a source of social unrest which is against the interests of the whole community. In the second place, it is said to be essential to the accumulation of capital resources which, irrespective of their ownership, are said to be vital to progress and, indeed, to the maintenance of industrial civilisation. In the third place, the satisfaction of fiscal needs, with the problems of the most suitable forms of taxation, raises important questions as to the economic reactions of inheritance. And lastly, the theory of socialism, continually urged as a better and more advanced system for economic life, is demanding profound changes in this principle.

It is my purpose here to ask whether economic science, standing clear of the political arena and so-called class interests with their mere defence of what is, or their mere attack upon it, has had any definite findings to contribute to the discussion of the whole case; and, if not, to suggest some of the chief questions which have to be explored and answered by economists before such findings can properly

[1] Presidential Address before Section F of the British Association, Oxford, 1926 (with modifications).

be arrived at, and to set out some possible or provisional answers which are at present available.

I am aware that a complete discussion of the matter extends beyond economics into ethical, and even philosophical fields. For example, suppose that a case of social injustice stands clearly proven upon all those facts which are apparent to and comprehensible by the average individual who is moved by such a feeling. But suppose, also, that if an extension of mental power or experience were possible, a second series of underlying tendencies could be brought into comprehension which would modify that case, and correct an illusion. What is the proper mode of action? If society has a right to determine its own form and destiny, must it be dealt with as it thinks it is, or as it *ought* to think it is? It may well be that the full economic case will ultimately present the most difficult dilemma of all—a dilemma of two planes, transcendental, or, at least, indeterminate. But my reflections upon the subject convince me that there is a field of deliberation and inquiry for economists which has, so far, only been casually and cursorily surveyed, but which must be carefully explored before the economic case can be presented.

II. Methods of Inquiry

It has often and rightly been remarked that economics suffers as a science because it is unable to avail itself of the method of agreement and difference as an engine of discovery. The isolation of the presence of a particular factor in order to discern if some effect or concomitant is always present; the isolation of its absence, to determine whether the supposed effect or concomitant is always absent; or, failing isolation, the association of that factor with a wide variety of others, and the observation of absence or presence of the antecedent with the presence or absence of the consequent; or again, the establishment of a quantitative relationship so that small and large "doses" of the antecedent are accompanied by small and large doses respectively of the consequent; all these methods of direct experimentation

open to the physical sciences are lacking to the economist. At the most he can follow by induction, with all the dangers of the false cause or the multiple cause, from observation of conditions existing at the same moment in different places, or at the same place at different times. If he is told that a given economic condition is brought about by a particular factor, such as a law or a social custom, he is seldom in a position to try the absence of that law or custom directly. Even if he does, the other conditions will not remain constant, and a logical weakness, if not a common-sense doubt, will exist. It will exist especially if some human likes or dislikes are involved, with consequent sectional feeling or sentiment. The precise economic effect of Prohibition, for example, is open to dispute because of the difficulty of dispassionate observation and reasoning where feelings as distinct from intellectual processes are involved.

But the economist has one advantage over the physicist. If the latter cannot actually remove the element in question from his phenomena or introduce it at will, he is usually at a loss. It is not generally open to him to *imagine* what would follow from its absence or presence, or to reason from analogy. (And here I am not overlooking the immense advances made by postulating from observation of what are imagined to be effects, certain qualities which any factor, operating as a cause, would need to possess, and then elaborating what would follow from such qualities if they really existed, and finding, under other or different circumstances, that those prognostications are verified. Working hypotheses of this order are the commonplaces of science.) I am rather referring to another kind of postulation from experience. We see about us a certain set of economic conditions, and co-existent a certain law or custom. Interest or ignorance, or superficial observation, or political prejudice, may urge that they are related as cause and effect. But the economist has to be wary and watchful. It is open to him to imagine an economic world free from such a law or custom, and by what he knows as to the behaviour of the average man under the hedonic impulse,

to work out a new or hypothetical economic system. This type of economic psychology is rendered more possible if there are, in fact, already in existence a number of individuals unaffected by the factor in question, whose behaviour is known and observed. By splitting the problem or the community up into its smaller significant or fractional sections, and making an estimate for each section, the possibility of error in the aggregated estimate is much reduced. If the resultant economic system which the economist deduces following the subtraction or the addition of the particular custom or law, differs widely from the actual state, then the effect of that custom or law is obviously large and important. But if much the same state of affairs is hypothetically evolved, then the explanation of such a state must be elsewhere, if the explanation that is being sought is a true differential.

Everywhere we observe that men are not born equal; stations or fortunes in life are influenced by the fact that A and B were their parents, and not C and D. Something that A and B did or had, that C and D did not or had not, lives after them, and influences the economic position of X, the son of A and B, so that he is essentially different from Y, the son of C and D. The fact that men "inherit" seems to be a fact that *prima facie* should have real economic significance. What would the economic world be like as compared with the present economic world, if men really started equal? Or what would the economic world be like if men started with great inequalities, but these inequalities were quite fortuitous and had no relation to the circumstances or qualities of parents? In either case we postulate a world in which inheritance is absent as an economic factor.

It may well be that such an analysis would be inconclusive or indeterminate at the last, that at certain points we find we need close or exact statistical data that are absent, that at others the balance of probability as to economic psychology in the mass is in doubt, and that at a critical point unbiassed scientific estimates differ widely. At the worst we should know the area of scientific uncer-

tainty, we should have exposed the points on which exact observation ought in future to be focussed; we should have given an estimated result with an idea of the probability of error. All of these stages are some way towards truth, at least further on than no analysis at all. In practical matters we may after all, like others who have not joined in our analysis, have to "jump" the gap and flagrantly guess, or act empirically by instinct. This the world has been doing on the widest scale for centuries while knowledge has been growing. But it is something to know that we are voting or deciding not indeed unscientifically but *non*-scientifically, which we have no business to do, save *faute de mieux*.

III. The General Heritage of an Environment formed under Certain Conditions of Inheritance

I am not referring particularly to what we call *our social heritage, i.e.* to what the whole community A enjoys by reason of all that the preceding whole community B has left, either produced and evolved by B itself, or received from and perpetuated by the whole community C that preceded B. I am dealing with the principles and fact of *individual* heritage. But the two cannot be wholly dissociated. As Professor Pigou has said, "Environments have children as well as individuals." And if the social heritage which A received from B was one in which individual heritage played an important part, it may well be that it is an entirely different social heritage from what it would have been if the practice of individual inheritance in that heritage had then been absent. All men to-day are the heirs of a body of knowledge accessible to them without distinction; to a system of law, and to a considerable amount of communal wealth in parks, roads and public facilities. That social heritage is an important factor in the total quantity of wealth which is produced in response to a specified aggregate of human effort to-day. If that heritage had been less in quantity or different in quality from what it actually is, the economic response to human

effort to-day would certainly be quite different. It may also be, though this is less capable of proof, an important factor in the *share* of that quantity which accrues to a specified individual effort on the part of M and N, members of that community, respectively. Now the social heritage in question when it was "incubating," so to speak, in readiness for the present generation, was incubating under certain conditions of individual inheritance. Would it have been the same social heritage if the incubating conditions had not included individual inheritance?

It will be seen, therefore, that while we may focus on *individual* inheritance, it cannot be wholly dissociated from the communal aspects. When M comes into the world, he has, as an economic unit, to associate with two types of assistance, *i.e.* what he individually inherits from his parents, and what he socially inherits from previous society, and in both of these the principle of individual inheritance has been present.

But this social heritage, which is either economically richer or poorer in potentiality because it was the product of a set of conditions which included individual inheritance, is one of the chief working assets of every individual to-day, whether he has the benefit of some particular individual inheritance or not. The effects of inheritance as a custom do not, therefore, exhaust themselves in the direct line, as may be clearer from hypothetical illustrations. Suppose that the power of bequest is an immense stimulus to an able man, who under its influence exerts his ingenuity to the highest degree, creates new capital forms and new mental embodiment of his genius in organisation. He raises the potentiality of the average worker as a unit in the social system, enriching himself and his social environment simultaneously. Under this system an individual in the next generation *observes* that he is not so well off as he would have been if the inherited wealth had not gone to the heir, but had been diffused over the community, but he perhaps fails to observe or realise that if the personal wealth had *not* been destined to go to the heir, the addition to the social heritage might never have come into being. He has

not, indeed, inherited his share of the *whole* results of that man's life, but only that unseen, unrealised part which was enjoyed by the community. It was, moreover, impossible to inherit both, because this non-inheritance of the personal part was a condition under which *both* the personal part and the social part came into being. Whether this is a likely picture of reality or not depends obviously on the initial assumption, *i.e.* whether it is true in any sense that the power of bequest is a real differential as an economic incentive. Let us take an assumption applicable to the environment as distinct from the individual, and suppose that the knowledge that the individual can leave his wealth to his son and not to the community acts as a social irritant, an economic "sulkifier." All workers' efforts are then crabbed and limited by their psychological state; their output is restricted, and often interrupted on trivial pretexts; they have no ready elasticity to participate willingly in new combinations of the organising mind. Then the total economic result of the community's efforts may be less than if our original mind had never exerted itself at all, producing individual wealth for individual bequest. The individual may, indeed, have abstracted, by his ingenuity, something as an accumulation for bequest, but the quantitative reaction on the economic or environment heritage is, in minute individual amounts, greater in the aggregate. The social heritage for the forthcoming generation to work with is poorer. Even if the lucky inheritor comes into his personal share he may have to employ it with an impoverished social heritage which will reduce his share far below what he, a man of ability, might have secured with a responsive social environment and a better social heritage. And each individual of that second generation has a poorer standard because of the stunted social heritage, poorer perhaps even if he had his share of the direct inheritance as a set-off. Here the truth of the conclusions is not objectively measurable, and depends on the truth of the assumption that the system is an economic irritant. Whether the system is an individual incentive or a social irritant, or both, or neither, is a question of average psychology. If both assumptions

are true, the effects may balance, and the resultant economic systems, with or without the inheritance factor, be identical. But if either is more powerful the result must be different, and a system including inheritance either worse or better than the system without it.

I have laboured all this preliminary analysis, because it is so necessary to observe that the social and individual interact; so necessary to convince people that the dynamic tendencies of forces affecting the distribution of wealth are at least as important as the static results, and may even be more powerful.

IV. Contributions by Classical Economists

The discussion by economists has usually arisen in connection with "social justice" in distribution, or justice and expediency in connection with taxation. I will take two examples:

In 1795 Jeremy Bentham asked the question, "What is that mode of supply of which the twentieth part is a tax, and that a heavy one, while the whole would be no tax and would not be felt by anybody?" His plan was to abolish intestacy, all property where there was no will going to the State. He also proposed to limit the power of bequests of testators who had no direct heirs and, in addition, that the State should have a half-share of sums going either under a will or not, to such relatives as grandparents, uncles, and aunts and perhaps nephews and nieces, and also a reversionary interest in the succession of direct heirs who had no children and no prospects of them. I am not concerned to give you all the various legal and philosophical reasons underlying Bentham's proposal. He held that this was not a tax, and that its chief advantage was freedom from oppressiveness. In the case of a tax on successions, a man looks on the whole of what is left to him as his own, of which he is then called upon to give up something. But if, under the law regulating successions, he knows that nothing, or only a small share, is due to him, then Bentham claimed that he would feel no hardship, "for

hardship depends on disappointment, disappointment upon expectation, and if the law of succession leaves him nothing, he will not expect anything."

Professor Seligman remarks that, exaggerated as Bentham's idea and distinction undoubtedly was, it contained a kernel of truth—namely, that there is no such thing as a natural right of inheritance, and that the extension of intestate succession to collateral relatives is, under existing social conditions, defensible only to a very limited extent. Graduation of the tax according to the degree of relationship was the definite corollary of his ideas. The idea of the basis of taxation described as the theory of copartnership originated later, when writers combined with Bentham's argument the thought that the State should inherit property from individuals because of what it does for them during their lives.[1] Andrew Carnegie, the millionaire, was an enthusiastic advocate of this idea. I am not concerned with the socialist or "diffusion of wealth" theory, based upon the doctrine that it is a proper function of Government to use the power of taxation as an engine of social improvement, to stop the growth of large fortunes and bring about an equal distribution of wealth. Here it is necessary to remark that those defences of inheritance which rest upon the family theory of property are not altogether consistent with that kind of freedom of bequest which is commonly found in English-speaking countries. In Continental Europe, of course, the "legitime," and in the United States some of the State laws providing for a certain portion of the estate to go in a definite direction, to near relatives, make for a better support of the family theory.[2] Seligman says that most thinkers, as well as the mass of the public, would still to-day maintain the custom of inheritance, not indeed as a natural right or necessary constituent in theory of private property, but as an institution that is, on the whole, socially desirable. Those who are not prepared to accept socialistic methods of reasoning cannot acknowledge the validity of the "diffusion of wealth" argument.

[1] *Vide* Max West, "The Inheritance Tax."
[2] *Vide* Note I, addendum to this chapter.

Other economists have discussed the question almost entirely as one of "social justice," and in so doing have often begged the question of its economic effects without examination.

John Stuart Mill held the view that there was nothing implied in property "but the right of each to his own faculties, to what he could produce by them and to whatever he could get for them in a fair market, together with his right to give this to any other person that he chooses, and the right of that other person to receive and enjoy it." He thought that it followed that although the right of bequest or gift after death formed part of the idea of property, the right of inheritance, as distinguished from bequest, did not. The succession, in the absence of disposition, by children or near relatives, might be a proper arrangement, but he agreed that there were many other considerations besides those of political economy which entered into it. He traced in antiquity a definite economic factor, where the disposition of the property otherwise than to the family surrounding it and interested in it had the effect of breaking up a little commonwealth, united by ideas, interests and habits, and casting them adrift upon the world. This created the idea of an inherent right in children to the possessions of their ancestors. But bequests at random were seldom recognised. Other reasons have usually been assigned by later writers, such, for example, as the supposition that the State in disposing of property along recognised lines would be likely to do it in a better way than the proprietor would have done, if he had done anything at all. Such reasons were hardly economic in their basis. Mill argued his case almost entirely on ethical and moral considerations, and not from the point of view of any greater economic advantage, either to the individual or the community. He reached more economic ground when he discussed the conflict that may exist between bequests and the permanent interests of the community. He says:

"No doubt persons have occasionally exerted themselves more strenuously to acquire a fortune from the hope of founding a family in perpetuity. But the mischiefs to Society of such

perpetuities outweigh the value of this incentive to exertion, and the incentives in the case of those who have the opportunity for making large fortunes are strong enough without it." [1]

By this he would appear to imply that economic expansion or betterment in one direction was more than offset by *economic* contraction or worsement in another, although one is never quite clear whether he is balancing against improved material welfare deficiencies in other kinds of welfare.

Of the French law he remarked that "the extreme restriction in the power of bequest was adopted as a democratic expedient to break down the custom of primogeniture and counteract the tendency of inherited property to collect in large masses. I agree in thinking these are greatly desirable, but the means used are not, I think, the most judicious."

When Mill comes to his case for limitation of bequests, he touches somewhat lightly several economic considerations—*e.g.* where capital is employed by the owner himself, there are strong grounds for leaving it to him to say which one person of those who succeed him is the best equipped to manage it and avoid the inconveniences of the French law of breaking up a manufacturing or commercial establishment at the death of its chief. He refers to the upkeep of ancestral mansions. He regards it as advantageous that, while enormous fortunes are no longer retransmitted, there would be, by the limitation, a great multitude of persons "in easy circumstances," for from this class the community draws benefits which are semi-economic or non-economic. Moreover, the practice in the United States, neither compulsory partition nor a custom of entail and primogeniture, allows for liberty to share wealth between kindred and the public, leading to munificent bequests for public purposes.

V. The Discussion To-day

Scientific economic inquiry into the subject of inheritance from the point of view of its purely economic effects has

[1] "Principles," Book II., Chap. II., § 4.

thus been very scanty amongst the classical economists. It is referred to, in passing, as a powerful factor in producing an uneven distribution of wealth, but its influence upon the direction of wealth production, or the actual aggregate mass of such production, has, so far as I am aware, not been really analysed. The economic aspect of the subject suffers from the fact that it has nearly always been developed in an environment of political thought rather than scientific analysis—*i.e.* as a programme of social change to be formulated or supported. As a consequence, therefore, assumptions have been made and adopted, without critical examination, for the basis of the case which the economist ought to admit only as the conclusion of abstract argument or definite research. However much a politician may desire to "get on" with the argument and develop his theme, and therefore treat as axiomatic a common belief, the economist who treats his science seriously is hardly justified in imitating him.

The normal approach to this subject is by way of innate or instinctive ideas as to social justice, based upon a study of distribution of product. It is pointed out that large individual fortunes exist side by side with extremes of poverty, or that a large proportion of the national income is enjoyed by a relatively small fraction of the people. It is suggested that the inequality arises from inheritance as an exercising cause, which therefore serves no socially useful purpose, or serves even a socially harmful purpose. It is stated to be an offence against the general sense of the fitness of things. The tendency by way of reaction is to assume that if the right of inheritance did not exist, the economic condition of affairs would not be similar, and that current economic problems would tend to be simpler and on their way to solution. This may indeed be the case, but it is not demonstrated. It may be one of those lucky instincts for *political* truth which the popular mind sometimes possesses. On the other hand, having regard to the unlucky instinct for error which popular *economic* ideas have been shown by experience to entertain, it is rather much to expect that in this particular matter instinc-

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tive judgment can be wholly trusted to dispense with analysis, reasoning or research. To put the matter quite bluntly, any assumption that an apparent social injustice is also an economic ill is a *non sequitur*. I am using the word "economic" in a strict sense, viz. in relation to the aggregate production of goods and satisfactions which are exchangeable, and which are produced in response to human demand and for human satisfaction, together with their distribution to individuals. I use it in no ethical sense, and am not concerned with whether the things produced in response to demand, or first produced and then provoking demand, are the things most worthy of human effort, or most likely to lead to the highest types of life, or even in the long run to give the highest forms of happiness. To bring in these conceptions would be to overweight the argument and analysis and make it intractable. It is quite sufficient here to deal with those aspects which are uppermost in the ordinary mind, that is, purely material welfare, the greatest quantity of objects of desire produced for the least human effort, the question of worthy use and aim being entirely begged until the economic conclusion is introduced into a set of considerations for "the whole duty of man."

Dr. Dalton, in his valuable work on "Some Aspects of the Inequality of Incomes in Modern Communities," summarises much previous observation on the subject of the effect of inheritance on the *proportions* of distribution. The different national practices in regard to inheritance may also be conveniently studied in his book, from which will be realised that the right of inheritance is not an absolute right of property, but has varied much in different places and at different times even in this country.[1] Dr. Dalton concludes that the effect of inheritance upon distribution of wealth has been almost ignored by economists.[2] He takes the view that inequality of incomes is due not merely to the direct influence of bequest, but also indirectly because inheritance enables some to have higher earning power

[1] *Vide* also Addendum I to this Chapter.
[2] *Op. cit.* p. 283.

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than others. But he does not specifically deal with the subject of the aggregate wealth to be divided.

Professor Hobhouse in his book on Liberalism says, "Inherited wealth is the main determining factor in the social and economic order of our time," with particular reference to the existing distribution of the common product. But there is no examination of its actual economic tendency in the sense in which alone an economic answer is complete. Professor Henry Clay, in his contribution to the Liberal Summer Schools, gives us the best approach to economic analysis of recent times, but even he does not come to grips with the central problem. He takes as his starting-point the inequality in distribution of property, as deduced statistically from the Estate Duty returns, and says: "This inequality enhances and, in part, accounts for the inequality of incomes which is the chief cause of social unrest and the chief cause of waste in the modern economic system." But again he recognises that inequality of property is, in part, merely a reflection of inequality of incomes. People with large incomes can save and so accumulate property. It is the diffusion of wealth that to him is the central problem, and, although the allied problems are there in his mind, he too takes much as axiomatic that I think ought to be examined. Mr. E. D. Simon, in a recent address to the Liberal Summer School, avows his object to be to point out "how *dangerous* is the social effect of the excessive inequality of wealth that exists among us to-day." He says: "There is a strong and growing feeling among the workers that the existing social and industrial order, with its excessive inequalities of wealth, is fundamentally unjust." And he gets the whole "jump off" in his argument by a graphic and moving contrast between the low wages and poverty of the jute industry and the great stone mansions of the jute lords, "set in spacious, well-tended gardens." The recent debate in the House of Commons on this subject, when reduced to its simplest elements, consisted of the following *non sequiturs:*

There are gross inequalities in wealth, which are socially

unjust. Inheritance laws bring these about, and if they were abolished wealth would be better distributed. If wealth were better distributed the average man would be economically better off. To be better off economically is to be aware of the fact and to be more contented. A sense of social justice and actual economic betterment are identical. People would then have a " fair start in life."

The economic question-begging, or confusions of thought on the other side, bluntly summarised, were :

> Capital is an essential of life, and the worker would be badly off if it were not accumulated. Incentive is required for this. Right of bequest is an incentive to accumulation; inheritance and bequest are correlatives. Therefore, if rights of inheritance were altered, capital would dry up, and workers would suffer. The worker has no real *right* to be annoyed or sulky at a system which really benefits him, and in which the appearance of social injustice is an illusion; therefore we can ignore the fact that he actually is annoyed and sulky. Great businesses give the worker something he would not otherwise have—they depend on the right of accumulation, and therefore inheritance laws are sacrosanct.

Now I would say that since what people think, however unjustifiably or erroneously, affects their conduct and motives, and has, therefore, economic significance, these ideas are, as existing features of conduct, economic *facts* or ingredients. But to say they represent absolute economic truths, or logical economic analysis, would be very inexact.

VI. The Problem To-day

Before we can approach to any conclusions upon inheritance laws as an economic factor we need research and analysis to give answers to a number of specific questions, some of them quite central and critical in making an economic contribution to the subject, and others less important, but helpful.

First, we have those which depend upon an inductive study of periods and places, and which can at best be only broadly indicative of the predisposing causes :

1. Has distribution tended to become more unequal under freedom of inheritance or bequest as time has gone on ?

2. Is it most unequal where freedom is greatest?

3. Is there any evidence that the actual standard of life and opportunity of a person of given powers has failed to improve under such a system, or has improved at a less rate than it would have done under another system?

4. Is there any evidence that the actual modal standard is highest wherever and whenever inequalities, however caused, are least?

5. Ignoring the *proportions* in which aggregate wealth or income is distributed, and focussing upon the increase in the aggregate wealth or income of separate communities, is there any evidence that the rate of increase is greater or less in communities with most liberal rights of bequest? (This is similar to 3 stated in another way, and disregards the effect upon average wealth which an increase or a decrease of population, stimulated by increasing prosperity, may have.)

Second, there is the group of questions bearing on the importance of inheritance amongst all the factors which promote inequality.

6. What other factors besides inheritance are held to promote or maintain inequality, and what is their relative importance in such causation?

7. What proportion of the number of recipients of the larger incomes draw such incomes wholly from invested sources? What proportion of the total *amount* of income drawn by the recipients of the larger incomes comes from sources unconnected with their personal toil or enterprise? (This is essential to help us find the relative importance of inheritance under question 6.)

8. If cessation of inheritance could in itself bring about even distribution, what would be the maximum effect on the average worker?

Third. Next we have to consider, *a priori*, whether the even distribution test is the economic *summum bonum.* This involves psychological factors, and whether anything is economically good in itself if thinking does not make it so.

9. Is absolutely even distribution an economic, as distinct from a social, ideal? *i.e.* will wealth production be at its maximum in quantity and quality?

10. If not, at what point is " gross " inequality reached? By what standards, absolute or comparative, does one conclude that a given range of inequality is " gross," " indefensible " and, above all, economically disadvantageous?

11. Is a " fair wage " a relative or an absolute idea? *i.e.* in view of differences between different epochs and countries, is there any evidence that men's ideas are sufficiently stable for a " fair wage " finally to be reached? How far is it the product of difference of station?

Fourth. Then we have to ask, what motives, with any economic effect, are set up in the human mind or will, by a system of free bequest?

12. Is the right of bequest an overmastering factor in capital accumulation? What proportion of capital accumulation would go on without it?

13. Is the sense of social injustice arising from it of economic significance in aggregate production?

Fifth. There may be directional or partial, as distinct from aggregate, advantages in a system, which are a useful ingredient in social and economic betterment, *i.e.* variety and stability as against mere quantitative tests.

14. Does the right of bequest materially affect economic values which are of importance in particular directions, *i.e.* effect on consolidation of estates, hindrance to natural development, the conservation of amenities as against utilities, continuity of policy, etc.?

Sixth. In the last group we have a series of inquiries which approach the problem from the reverse direction, and also have a highly practical bearing.

15. What are the economic consequences of discouraging or nullifying bequest and inheritance by heavy taxation? Is there any evidence to show that wealth distribution is made more even in this way, *ex post facto*, or that aggregate wealth making is discouraged or wealth-making capacity is reduced?

16. As regards the many who benefit, what is the effect upon motives towards production and towards psychological contentment?

17. As regards the few who suffer, what is the effect upon motive to work and to save? Must a given amount of taxation laid upon a given amount of capital wealth left at death have the same total effect, however it is imposed? Is it possible to arrange the imposition on any principle which will depress wealth-making motives to a minimum degree and fall more heavily at points where the harmful economic reactions are least?

There is a seventh group of questions which deal with the broader aspects of inheritance.

18. As other things besides objective wealth are inherited, can wealth be really or effectively dissociated from them?

VII. Comparative Inequality of Distribution

I regard the foregoing imposing schedule of questions as all pertinent to the economic inquiry. To some of them we have at present no answer at all; to others we have a partial answer or general indication; to others, again, a little reasoned analysis will afford us a high degree of probability. Within the scope of this essay I cannot do justice to all these questions or explore them all. I may perhaps summarise what we know in regard to some of them, give provisional answers to a few, and suggest my views on others.

1. I have been able to find no positive evidence that the slope of distribution has materially changed in the past hundred years.[1] The scale of wealth is different and the whole population is strung out on the line further up. There are probably at the very top much richer men, and wealth on a scale unknown in former times. In this way I think that a given minute fraction of the people holds to-day a slightly larger fraction of the total income. So much of this has arisen, in the cases of great wealth, from activity during the income-receiver's life that it is not so much a part of the problem of inheritance as of distribution of the product of industry, the potentiality of the industrial system and accumulation of savings during life. This broader aspect of distribution is not the subject of our

[1] *Vide* my "Wealth and Taxable Capacity," III.

discussion. Some forces tend in an opposite direction, *i.e.* to lessen the centralising force of bequest: Heavy death duty taxation on these large aggregations, and the lessening importance of land in total wealth, and the weakening influence of primogeniture, which makes for family diffusion rather than concentration. Even if the distribution slope has not greatly changed, probably the inheritance system affects the angle of the existing slope. Professor Pigou remarks, in regard to the alleged immutability of the Pareto law, that income depends not on capacity alone, but on a combination of capacity and inherited property, and the latter is not distributed in proportion to capacity but is concentrated upon a small number of persons. This must deflect the curve from its normal form. The actual form cannot, therefore, be "necessary" unless the broad scheme of inheritance now in vogue is also necessary. But a very large change in the existing laws is not essential to bring about a great difference in the income curve, since property is more unevenly distributed. Thus $76\frac{2}{3}$ per cent. of the population owned only 7 per cent. of the property, but 73 per cent. owned $35\frac{1}{2}$ per cent. of the income. (Clay, "Property and Inheritance," p. 19.) As regards the United States, Watkins ("Growth of Large Fortunes") says: "For wages, the upper decile is less than twice the median down to 5/4ths the median. For salaries it is twice the median, and for property eight times the median." So far as Great Britain is concerned, the statistical indications are that static redistribution to-day would not add an appreciable different *percentage* to the modal income than formerly. Statistical evidence for past years for other countries on this point is too scanty to be of any use. There are no distribution figures of any value for Germany prior to 1890, and none for France at all, while the United States figures are good, but quite recent, and no comparisons with earlier times are possible. Research in this field, I believe, will be barren, and in the case of the United States, owing to other powerful factors, the figures would be inconclusive.

2. Distribution seems to me to be probably less unequal where bequest is trammelled, *i.e.* the "legitime" in Con-

tinental countries makes for family diffusion and equality, as in France and Germany. But for what it is worth, we must observe that the two richest countries have freedom, and the next two in order of wealth have conditional bequest. The only considerable one, Russia, which for a short time had no rights of inheritance, during that period was rapidly sinking into poverty, but this tendency, of course, cannot be assigned merely to inheritance custom. In any case, owing to the effects of the war, the comparison must be confined to pre-war years, and the evidence will be found in the tables in my "Wealth and Income of the Chief Powers." [1] There is room for research and some comparative study of the diffusive effect of the "legitime" as compared with our own system. It must be remembered that, so far as all past wealth is concerned, without accumulation and concentrative power for new wealth being fully maintained, there must be an increase in equality if wealth is left to *all* the children, even where the effective birth rate for the wealthy is not maintained near the national average. If 5 per cent. of the adult population own half the property, then in the two generations (assuming a similar birth rate to the general) without any new accumulation, and, say, three times the total population, this 5 per cent. would still own one-half, but they would be three times as numerous and their individual shares only one-third the size. Now *new* accumulation must be relatively of great importance if the individual fortunes of the richest people are to be on the old scale of magnitude. It follows, therefore, that in the economics of the *very* rich, current or immediate right of accumulation tends to be much more important than inheritance at the second and later stages. Taxation and family diffusion tend to reduce the long-range inheritance effect on the size of individual fortunes in such a way that even if inheritance ceased altogether, the existence of the very large fortune would be very marked under the influence of other economic factors.

3. My conclusions as to the average position or actual standard of life have already been given elsewhere [2] I

[1] In "Current Problems in Finance and Government."
[2] "Wealth and Taxable Capacity."

found that, during the 120 years prior to the war the real position of a typical or standard person in this country—*e.g.* at the lower decile—had improved four times. During this period the inheritance system has been fully in force. There is nothing to *prove* that the rate of increase would have been more if it had not been in force. Education and improved health have doubtless done a great deal in this advance, but probably the quota of accompanying fixed and circulating capital per head in improved machinery and transport has been the most effective feature. The question is, therefore, thrown back on to the inquiry, which hardly admits of statistical research, whether the accumulation of capital (regardless of ownership) could be as great under another system. There are four rival systems on which we may depend for the aggregate saving: (1) dependence on the better-off; (2) equalising individual resources and then expecting each individual small income-receiver to save; (3) saving through taxation; (4) collective saving (*e.g.* company reserves). In my view the third is the least satisfactory; the second ought to be the best, but, in fact, is not. The call of spending on a small income is great, and it is difficult to save permanently for fixed capital assets. One man with £10,000 and 500 with £100 per annum may save £8000 with its improvement in the future incomes of the 500, but on even distribution 501 people will each have £119, and they are not likely to save £16 each and spend only £103. This is where the redistribution due to heavy taxation is affecting our present aggregate savings to-day. Although the workers are saving more, they are not making up the gap so caused. The real rival to nineteenth-century saving is the saving that goes on silently through company reserves, etc., and that never actually becomes anyone's spendable resources at all.

4. Inequalities of wealth appear to be statistically less in France and probably in Germany, and certainly in Italy. In all these the average standard of life is lower than in the countries where inequality is greatest. There is, therefore, no statistical correlation between extremes of inequality and poverty of standard. The association is probably in the

opposite direction, but this is, of course, no proof of actual or causal connection.

5. The comparative rapidity of increase in total national wealth can be tested by statistics only to a limited extent (*vide* "Wealth and Taxable Capacity"). We can go back to 1850 with the United States, where other factors than inheritance are so powerful, but some research would be needed to give good comparisons for the countries with limited rights of bequest—France, Germany, etc.

6. Coming now to the second group of questions, No. 6, Dr. Dalton has analysed some of the causes of inequality besides inheritance in the work referred to. But quantitatively we know little of their relation. Probably 110 years ago, when the income from property was to the income from business as 100 to 60, instead of 100 to 400 as it is to-day,[1] the effect of inheritance and accumulation on distribution was far greater than to-day, when many of the highest fortunes have been made within the lifetime of the holder, without significant initial resources. I think there is considerable room for statistical research upon this matter in different countries.

7. The proportion of people in the higher ranks of income who have income from occupations or businesses in which they are actively engaged, and also the amount of the income so earned in relation to the total income in each class is as follows: Speaking generally for the total incomes of those with from £10,000 to £100,000, there has been a tendency for the proportion of income coming from earned sources to increase, and it would now be about 30 per cent. The proportion for the incomes over £100,000, of course, is rather lower. I have no means of knowing how much of this 70 per cent. comes from savings accumulated within the lifetime of the possessor, and how much from inherited wealth, but having regard to the rate of increase of the national wealth in the past fifty years, and the rate of increase of the inheriting population, it is probably a much smaller proportion from inheritance than is popularly supposed.

Professor Haensel, of the State University, Moscow, says

[1] *Vide* "British Incomes and Property," Appendix IV.

that he collected more than a thousand biographies of rich men in many countries, but unfortunately his data were lost during the war. He states his conclusion that "inheritance has no great importance in the uneven distribution," the greater part being made in one generation by self-made men, and "only in a few instances of settled property is wealth kept through successive generations." He remarks that the German proverb "the third critical generation"—compare our Lancashire saying: "Clogs to clogs in three generations"—has proved to be true after a particular study of wealthy people in Hamburg over three generations.

But when we come to consider how many of the rich people have an occupation earning income, there are over 70 per cent. earning and under 30 per cent. who have investment income only. (In the highest incomes the percentage of incomes from investment only is much smaller.) Out of this 30 per cent. a good proportion are, of course, doing voluntary unpaid work as magistrates or in other public positions; another section comprises women who have no opportunities; while another section would be men too aged to work. Since 16 per cent. of the large estates corresponding to these supertax incomes are left by women, we may deduct 5 out of this 30 per cent., leaving 25 per cent. for men. But since out of all estates of the magnitude left by men, 76 per cent. are left by men of over sixty-four, this leaves only 6 per cent. out of the 30 per cent. for younger men. Making due allowance for mortality rates in the estate distribution tables—for, of course, the larger investment fortunes tend to be concentrated on the higher ages—on the whole, I should doubt whether the percentage of able but *unoccupied* men living entirely on investment income in these classes exceeds 10, and it may be as low as 5 per cent., or, say, under 1000 people. The actual *numbers* of the 'idle" in the classes from £1000 to £10,000 would exceed this by far, but I have no means of knowing whether the percentage is greater. Moreover, of those gainfully employed, only a minority are drawing their earned incomes solely from

[1] *Vide* official evidence given before the Colwyn Committee on the National Debt and Taxation.

directors' fees, and the majority have industrial or financial activities in which they take a personal part.

8. I think the only test of the effect of equal distribution of wealth upon the average worker would be by distribution of the income. I have already published my statistical conclusion that if all the incomes in excess of £250 were pooled, then, after deducting the present taxation and a fund of new savings equivalent to the pre-war real savings, it would not give each family more than 5*s*. per week.[1] But much of this redistributed income is earned income, and therefore the redistribution of property income would give spendable income falling below this figure. There is room for research on this question for the United States, France and Germany.

VIII. The Standard of Life and Psychology

The third group of questions deals with the psychology of the standard of life and of equality of distribution.

9 and 10. There is as yet no economic evidence that equality of individual income, whether derived from earnings or from property, would give the maximum economic advantage. Nor is there evidence that equality of investment income added to unequal earned incomes would give an optimum point for national production. There are three possible assumptions:

(*a*) That the community should take over all accumulated savings at death and hold them for common enjoyment in new social services in common forms, and in payment for all public services; (*b*) that the population should receive the income and dividends by equal sharing; and (*c*) that compulsory family diffusion would do something to mitigate concentration in Britain and the United States.

I have referred above to effects upon accumulation of savings which I regard as of enormous importance in economic advance.

One may learn something from the proved effects of remission of taxation and social expenditure, that direct

[1] *Vide* "Wealth and Taxable Capacity," III., and "The Christian Ethic as an Economic Factor," Appendix III. Also Bowley, "Distribution of the Product of Industry"; and Chiozza Money, "The National Wealth."

additions to individual resources soon exhaust their effects as direct additions to that kind of contentment which makes for incentive to greater or better output. The addition becomes the expected and the normal, and there is no evidence that an improved standard of life in fifty years has made, through *incentive* alone, for harder work. It has made a physically better worker, and improved output has proceeded from this cause. In fact, even short-period effects are often disappointing, and a betterment of conditions through improved rate of wage has been partially offset by claims to shorter hours by regulation or absenteeism. Here psychological effects are not identical in different countries, and by no means all the workers aim at working long enough or short enough, as the case may be, to bring in a normal wage.[1] If this is the case for additional direct rewards, it is pretty clear that indirect additions to income through parks, libraries, roads, etc., are much more removed as a direct stimulus to increased economic effort. A small minority of workers will respond to the social idea in which their additional effort will not enrich the few and carry down the unearned property of those few to the select heirs. As regards those whose incentive is being considered from the point of view of deprivation of the privilege of bequest, we may study these later. A more even family diffusion presents a difficult problem, which the example of France does little to elucidate. Those who base their views as to the effects of inheritance not so much upon the facts of inequality as on its extent, its "grossness," do not indicate at what point inequality ceases to be defensible and becomes mischievous. We are entirely without guidance upon this subject, nor does it appear that there will be a consensus of view upon it sufficiently stable for common action. One cannot be dogmatic upon this, because a similar lack of standard exists for fixing proper rates of progression in taxation; but the problem is roughly, though only temporarily, solved in practice, and progressions tend to increase in steepness, the instances to the contrary being very few. Just as ideas about a fair standard of life are relative, so

[1] *Vide* p. 195.

ideas about the weight of taxation are relative too. If anyone doubts this let him read the Parliamentary Debates on the subject of the income-tax at 1*s.* 3*d.* in the £, which was "gross" and "indefensible" and "disastrous." I think, therefore, that it would be exceedingly hard to say at what precise point between 1·3 and 1·8 in the α slope of the Pareto line the line becomes either economically indefensible or an offence against social justice. I am impressed with the importance of a general popular sense of social injustice as a basis for political ideas, in the absence of exact standards, but I distrust its finality as an economic conception.

At the same time, men are moved in economic action by motive, and the motive is no less potent because it is incorrectly or inadequately informed.

It is my conclusion, after much study of men's attitudes, that they are much more affected by comparisons than by absolute facts.[1] Under a state of affairs in which accumulation, inheritance and bequest have been the rule, A finds himself in possession of 10 units out of a total of 10,000, and he sees B enjoying 1000 out of that total. His assumption may be that if the present practice of inheritance did not exist, but some other practice obtained in its place, he would enjoy some different number, a number, in his judgment, much more than 10—say 20—and B would have less, say 500. Or perhaps he assumes that equality would reign, and that with 500 inhabitants each would enjoy 20. This, so far, is only an argument *post hoc ergo propter hoc*, for, failing demonstration, some other reason may exist for the difference. But it is almost invariably assumed in this, as in other discussions of distribution of wealth, that under a system in which inheritance was not the rule, the aggregate

[1] Dr. Dalton, in touching upon ambiguities and confusions between absolute and relative shares, dismisses this aspect by accepting it. "Though absolute shares are the chief determinant of actual economic welfare, relative shares are one of the determinants of the potential economic welfare, which might be realised under a different scheme of distribution. Human psychology is such that the satisfaction, and hence the economic welfare derived from an income depends not only on the absolute size of this income, but also on its relative size as compared with other incomes." *Op. cit.*, p. 161.

production to be divided would be at least the same—viz. 10,000 units—whereas of course it remains a probability that it would be either less or more, and an improbability that it would be identical, for the inheritance system must have *some* appreciable economic effect on accumulation and production. Suppose, for example, that inheritance, whatever its effects on distribution, has a net beneficial effect on aggregate production; then it might well be that, instead of 10,000 units, there would in its absence be only 8000, of which A would have 18 and B 500—that is, the distribution is not so extreme, though measured absolutely all are worse off. Now men are not given to the comparison of absolute changes, mainly because they are not available at any moment of time, and are at best historical. They do not compare their own absolute position at one moment in their actual condition with what it would be in hypothetical conditions. Neither does it impress them very much if it is proved to them that under the existing scheme of society they are four or five times as well off absolutely in goods and services as their forefathers in similar circumstances a hundred years ago. They compare themselves with their fellows at the same moment of time. So a man may be even worse off absolutely, but his sense of social justice will be less offended if the difference between himself and B is less marked than it was. He would rather have 10 per cent. of a moderate cake than 8 per cent. of a larger one, because he is always comparing his angle of the sector with another man's angle or the length of the arc, but never thinks of the cubic content. As a matter of fact, any sense of injustice in distribution based upon this attitude of mind is a very poor measure of actual economic welfare.

We can thus postulate three possible positions of the economic aggregate for a community which results when a system of unlimited inheritance is banned as compared with a system where inheritance is in force. The first is that it would be lower, the second that it would be the same, and the third that it would be greater. But this tells us little about the fortunes of a particular person A of given ability and energy in that community. These

three cases may be subdivided to give twelve conceivable positions.

1. *Where the aggregate is lower than* 10,000—*say* 8000 *units.*

	A's actual position.	Wealth distribution and A's sense of justice.
(*a*) A's fraction higher than 1/500th and actual sum greater than 20—say 25 or 1/320th	Better	Better
(*b*) A's fraction higher than 1/500th, but actual sum the same—say 20 or 1/400th	Same	Somewhat Better
(*c*) A's fraction the same, but actual sum lower—say 16 or 1/500th . .	Worse	Same
(*d*) A's fraction and actual sum both lower—say 15 or 1/600th . .	Worse	Worse

2. *Where the aggregate is the same*—10,000 *units.*

	A's actual position.	Wealth distribution and A's sense of justice.
(*a*) A's fraction higher than 1/500th and actual sum greater than 20—say 25 or 1/400th	Better	Better
(*b*) A's fraction and sum the same—20 and 1/500th	Same	Same
(*c*) A's fraction worse and actual sum lower—say 16 or 1/625th . .	Worse	Worse

3. *Where the aggregate is higher—say* 12,000 *units.*

	A's actual position.	Wealth distribution and A's sense of justice.
(*a*) A's fraction higher and actual sum higher—say 1/400th or 30 units .	Better	Better
(*b*) A's fraction the same and actual sum higher—1/500th or 24 . . .	Better	Same
(*c*) A's fraction lower, but actual sum higher—1/545th or 22 . . .	Better	Worse
(*d*) A's fraction lower, but actual sum the same—1/600th or 20 . . .	Same	Worse
(*e*) A's fraction lower and actual sum lower—1/800th or 15 . . .	Worse	Worse

On the assumption that it is a definitely higher *fraction* of the total, as distinct from a definitely better absolute amount, which will give rise to a feeling of greater contentment or a less sense of social injustice, it is clear that there are only three out of twelve possible alternatives which can yield the required result, although there are five possible cases in which A may be actually no worse off and five in which he may *feel* worse off.

Here I may pass to question 13.

To what extent does a *feeling* of social injustice operate to affect a man's motives to make him work harder, or less hard, or work less regularly, and thus in itself become, psychologically, an economic factor affecting the aggregate production? It is only in certain special circumstances that the feeling will lead to harder work. It would do so where an effort to escape the inferior position is great, but this is hardly distinguishable from the incentive which is afforded by the prospect of wealth, and of distinction itself, which must be examined separately. It is probable that with many temperaments the feeling operates to exasperate, not indeed all the time, but at occasional periods when the difference is brought home by some marked external incident. It is probable, therefore, that it contributes to an underlying feeling of unrest, and a complete unwillingness to do more for the wages obtained than the minimum that will pass muster. There must be many thousands, even millions, who continue to accept inequality, not so much of wealth, as of wealth due to *inheritance* as part of the scheme of things against which they have little grievance. They are believers in "luck," and coming into wealth from a forgotten uncle in Australia may move to envy, but it does not lead into malice or resentment. These vast numbers are not sufficiently touched in their economic activity by a sense of social injustice in every-day life to work less faithfully or less hard. There are, however, numbers who, in times of distress and unemployment or labour trouble, can be brought to considerable moral reaction against any display of luxury on the part of the "classes" who do not work for

a living. We have heard of the resentment against mining royalties, which as a peculiarly provocative form of inherited wealth are contributory in a special degree to that lack of good feeling in the mining industry which has a marked economic significance in output. In my judgment the feeling of resentment against wide differences of fortune due to inherited wealth is seldom distinguished in popular feeling from differences due to the right of accumulation as distinct from inheritance. It is the inequality of reward and the multiplying power of accumulated wealth which excites animosity, not so much that particular part of it which may be due to the inheritance system. I find it difficult to believe that a sense of social injustice *addressed simply to the existence of a system of inheritance* is, in itself, an important economic factor. The average Englishman is unaware that inheritance is not a " natural right " existent at all times and in all places. If he has any sense of injustice it is against inequality in general, and not against inequality as brought about by this system.

I have made many inquiries in America of workmen and of those who are in touch with them and know their psychology, and I am assured that grievances about inheritance as such have no adverse effect whatever on production. Indeed, I was assured that inequality of wealth, to which this is contributory, stirs men to effort, to emulation, to ambition, and gives a dream and a goal. In this sense the inequality serves to urge many to greater efforts than would otherwise be made if all were on a dead level of attainment and power.

At the same time, so far as this country is concerned, if there were no inherited wealth at all, it might be easier for the average mind to accept as inevitably associated with difference in human capacity, and even with the luck of the game, inequalities of fortune arising entirely in their own lifetime. But the rooted practice of the " legitime " in France gives an entirely different outlook upon the abolition of inheritance altogether in its psychological influence.

I can give the answer to question 11 only generally, viz. that ideas concerning the standard of life and fair wages are

relative and not absolute. As arrived at subjectively, they are of little use as an indication of economic actualities or possibilities. I have dealt with this elsewhere.[1]

The right of bequest and the right of inheritance respectively may differ as incentives. When we come to consider the effect of an inheritance system, we have four sections to study. We divide, first, on a time basis, into those living at the time wealth is accumulated in response to the stimulus of the system, and those living at later times when the wealth accumulated has been inherited, and when the system has the effect of " dictating " the distribution of currently produced wealth. Again, we divide the people in each period into two functional sections, those who do the accumulating and those who watch others do it.

Here we are in the field of personal views about human psychology in the mass, although the statistics of the growth of life insurance, and the proportion of wealth left out of the direct family line, are valuable. There is room for research into systematic life insurance statistics, but the indications are clear that the family provision incentive (including a buttress against death duties) is more powerful even than formerly. There is fair statistical evidence that the proportion of amounts bequeathed to distant relatives and " strangers " to those bequeathed to close relatives was relatively stationary in the depressed eighties, and with the rising tide of prosperity in the twenty years before the war, slowly rose and has since fallen. Two kinds of incentive must be distinguished—the first is to save more out of a definite income or work, and the second is to produce more in order that still more may be saved. Two kinds of objectives must be distinguished: first, provision for old age merging into provision for a surviving widow, but irrespective of children's welfare; and, second, provision definitely for children or others. A positive and a negative side must be distinguished: first, the positive right to bequeath may have less importance in creating savings that would otherwise not exist, than the knowledge that all savings must

[1] " Wealth and Taxable Capacity," III. Also " The Christian Ethic as an Economic Factor."

be annihilated would have in stopping savings coming into existence at all. If there were no power to bequeath by *inter vivos* giving, there would be a great tendency to individual *de*cumulation.

My own view, after long consideration of the available data, is that the power to bequeath savings that will remain intact is a most important factor in wealth accumulation and saving, and the desire to leave these savings for the direct line, children and grandchildren, is an important special case of that incentive. For estates over £1000, 80 per cent. of the married men and 90 per cent. of widowers have children living at the time of their death, while married women and widows have children in 68 to 70 per cent. of the cases. There is no weakening of these figures—if anything the reverse—in the higher sections. In 10 per cent. of the cases of single men there are parents living at the time of death. Intestacy, of course, decreases with the size of the estate, and in the case of single men, for estates exceeding £1000, over 21 per cent. die intestate; but in the case of married men it is under 10 per cent., and even less for widowers. But I am equally convinced that the mental horizon, which is so powerful an agent in business calculations during life, which reduces the present value of a reversion over fifty years hence to a negligible figure, is even more restricted for events after death. The fate of one's savings (with the special case of landed estates ruled out) after, say, thirty or forty years, has but a negligible influence on present effort or production. I therefore accept the popular estimate of this incentive, but I emphasise it much more in its immediate effects and belittle it much more in its final effects. This distinction is of great importance in the theory of taxation.

As regards incentive to the recipients, it is possible to exaggerate its influence in making idle men, who would otherwise add more to the mass of production. This effect really exists, but it is a very slight percentage of potential production, however glaring individual cases may be. A man who has great capacity to add to production and raise the general standard, has enough character not to be idle and unproductive simply because he has other means;

indeed, he may play less for safety and be a risk-taker and pioneer, and so add to economic welfare. The gilded idlers would not, in any case, have made much greater economic additions than their own subsistence. I am not referring to moral or ethical aspects, of course.

But the effect upon subsequent saving and accumulation is most important. A man with an inherited fortune of £20,000 who works hard and makes, say, £1500 a year, has no strong incentive to do any more saving out of his combined income of £2500, and may be content to pass on the £20,000 intact. But for this fortune he might have been a *new* saver. I think there is singularly little statistical evidence of *accumulative* saving, and while inheritance sustains inequality, it does not greatly increase it; the old inequalities of fortune are fed from new inequalities in earning and the immediate bequests made from that source. I doubt, therefore, if the deterrents to saving which high death duties create are so important in their final effects when one considers the increased incentive to new saving (and perhaps effort) which the lesser fortune to the recipient brings about.

IX. Special Cases of Inheritance

Land.—One of the most obvious ways in which the laws or practices of inheritance move to a direct economic result is in the sphere of land tenure. Clearly, there will be a *prima facie* difference between the agricultural conditions that would exist after a long period of compulsory division of property on Continental lines as compared with centuries of primogeniture and the desire to maintain large land units intact. There have been certain important changes lately in the law of property which may have economic reactions.

In stressing the importance of the right of bequest without diffusion, reference is frequently made to the continuity of management and interest in large businesses. A man of energy and resource builds up a great business, and one of his incentives is the knowledge that he is training his son to follow him and make it greater and better. The old instinct which vented itself in landed estates passes to commerce.

It is urged that the right to bequeath and the power to keep the control in the family has been an actual feature in economic development, in this country at any rate, and a study of the history of typical firms, especially in the north of England, during the first three-quarters of the nineteenth century, does much to confirm it. But it is doubtful whether such a practice occupies a sufficiently important place to-day to deserve a front place in the general argument. Two modern features have seriously influenced it. The first is the growth of an independent managerial class as a profession who can, for a salary, pass from business to business and lead its administration. The second is the facility with which private businesses at the height of success pass into the joint-stock form, often with a public issue of preference shares, and the family taking the cash and retaining the equity.[1] The percentage of profit made by private businesses out of the total changed from 70 to a little over 30 in a period of forty years. It would be a bold thing to say that a big business depended to any serious extent upon continuation of direct family control or interest for a number of generations. On the contrary, the infusion of new blood and outside interest has rejuvenated many a business that has been living on its traditions. The death of a rich part-owner rarely affects modern business. The proportion of wealth, excluding War Loan, passing in the form of shares at death, has increased from 32 to 48 per cent. of the whole in ten years. However important this element of inheritance may have been in the past, it is now relatively insignificant in dealing with the whole mass of accumulated saving.

A correspondent who raises no claim to be an economist sends me a thoughtful letter in which he says :

" I live in the country and have some opportunities of observing and reflecting upon the *more primitive social and economic*

[1] *Vide* Chapman and Ashton on " Sizes of Businesses " (*Statistical Journal*, 1914) and " Growth of Textile Businesses " (*ibid.*, 1926). Out of 221 concerns in 1884, 127 were private firms with a modal size of 20,000 spindles, the mode for companies being about 80,000. In 1924, out of 203, only five were private, with 20,000 spindles as a maximum. The mode of the companies was about 110,000 spindles.

order of the countryside, centuries behind the specialised professional labour of the city only a dozen miles away. As long as sons generally followed their father's trade—as I suppose they mostly did in England until a century ago—it seemed reasonable that *a son should inherit his father's tools*, and this not so much because he is a son as *because he is a junior partner in business*. For any outside body, parish, county, or state to step in with an extraneous claim to these tools or to some of them is simply to shatter the economic order and the chance of maintaining production just when the business is hard hit by the loss of its senior partner. To-day 'tools' might be interpreted in the city to include a factory and all its machinery; in the country 1000 acres of woodland is a means of production using the sun's radiant energy instead of coal. The limited liability company is a shock-absorbing system in the economic order of the city, and factory work goes on in spite of the funeral of a director. In the more primitive order of the country the death of the landlord may paralyse his estate. Even if one were to accept the argument that big estates ought to be broken up into small estates (no matter whether these would be more or less remunerative per acre), one effect of heavy death duties levied on rural estate is to withdraw capital from agriculture at a most inconvenient moment. Death duties on a landlord's personal effects—pictures, furniture, etc.—might have one sort of justification—the distribution of luxuries. Death duties (in excess of one year's rent on land) may mean the paralysis of repairs, fencing, draining, planting, etc., for years and inhibition of capital development for decades. It might be more defensible if death duties on land all went to the Board of Agriculture to be redistributed to the same industry in the form of agricultural education, expert advice, new breeding stock, etc. But the drain on the *capital sources of the industry* (to be distinguished from the drain on individuals) has widespread effects which need not be confused with the whinings of discomforted individuals. The old order accepted disposition by will to the family; it was justified as long as the family continued the business. If the families do not continue the business, would it be wise to initiate a new order in which *inheritance should go by occupation*, so that if a manufacturer died intestate his employees would succeed to his factory, so that legacy duties should differentiate not in favour of near relatives, but in favour of those in the same business, so that if there were any death duties these should go not to the State but to the trades union, or in bonus shares to the employees?"

Businesses both of landowning and of commerce have become so impersonalised that no great case for unlimited powers of bequest for economic reasons can be based on the

objective personal link. We are thrown back on the subjective factors.

X

In the sixth group, with questions 15 to 17, we touch upon the large question of the influence of taxation, and it would take me too far afield to deal with them at all adequately, because they involve comparisons with the effect of alternative methods of raising revenue. But in the Report of the Colwyn Committee on Taxation and the National Debt, which deals with many features of importance, I have put my views into the common stock. I will content myself with saying that *if practical considerations are ignored*, to raise a given revenue with some reference to graduation by order of succession and time, on the Rignano principle, and to extend the graduation of taxation of bequests outwards by relationship, would, in my judgment, offer some important economic advantages over the present methods of raising the revenue.[1]

XI. Inheritance of Ability

The principle of the inheritance of wealth is complicated by its biological affiliations. A man has certain qualities which make for distinction and success in himself and for unusual service at the same time to the community. His son may inherit a full or partial measure, and this inheritance is a factor of economic importance, making both for an uneven distribution of the aggregate of wealth, which is obvious, and also, what is less obvious, for a greater economic aggregate for all to share. Now such inherited powers, so far as they exist, are a part of nature, and cannot be gainsaid, nor abrogated, nor repealed. But in a developed national science of eugenics, in a socialistic community with a certain type of socialist ideal, in which equality of division of wealth (or wealth-making power) is counted as of greater importance than the greatest accretion to aggregate wealth unevenly divided (by which the individual benefit may be

[1] *Vide* Addendum to this Chapter.

even greater after subtracting the rich man's portion), it would be logical to direct human mating so that inherited tendencies to superior wealth-making powers should be diffused or defeated. If it were found that the mating of types A and B would perpetuate a characteristic particularly forceful in economic affairs for the individual exercising that characteristic under the hedonic stimulus, and not exercising it under any other, but that the mating of A and C would obliterate it, then the obvious duty of those who put equality of wealth as paramount would be to promote eugenic laws that discouraged A and B and encouraged A and C to matrimony. But I do not wish to pursue this type of eugenic speculation. I am dealing with the inheritance of qualities, only because of the argument that a man's accumulated wealth is an objective extension of his personality, a material result of his qualities, and that if nature passes on the effective element of his personality to his heirs this extension logically and legitimately, by social sanction, goes with them.

In my judgment, while we are apt to regard the cultivation of mental, moral and physical qualities, and their effect upon future descendants, as biological problems, internal to the human organism, we also tend to regard those extensions of a man's personality which are reflected in his ability to acquire and accumulate belongings around him, as purely economic. No such hard-and-fast line is final. A man may enrich his life by the expenditure of a part of his income in immediate travel and widening of his powers and knowledge, or he may externalise it by the acquisition of works of art, or he may put it into the field of economics by saving that portion of his income so that it will yield him an income which will perhaps enable him to travel or to extend his personality in some way or other in years to come, after he has ceased to be an earner. Similarly in his treatment of his children. For one he may spend a large amount of money to make him a professional man, a doctor or solicitor, in which case the bequest or inheritance goes on without any obvious sign of his " leaving " wealth. To another son he may leave an equivalent amount to be invested in a business,

and if they are men of equal ability it may be assumed that the income from personal effort and invested capital will be similar in the business and in the profession. In the one case the effect of inheritance is clear; in the other it is masked. Nothing can stop him bequeathing certain personal qualities of character and the environment of early life to his children, and they perhaps, in a less marked degree, to his grandchildren, but that extension of his personality which represents the modification of their environment by their control over saved wealth seems to be on another footing. But a man conscious that his sons were "fitted" in the best sense, and that they ought to survive, could help their survival both by personal training and also by accumulation of wealth which he bequeaths to them, in either case representing personal self-denial, and in either case representing some quality imposed upon their human environment. Whetham, in "The Family and the Nation," says that unless the fittest to survive hand on their qualities to a larger number of descendants than are left by the failures, natural selection cannot act. It is of no use for an organism individually to survive unless it transmits the character which enabled it to do so to a preponderating number in succeeding generations. A struggle for life and the survival of the fittest are meaningless alone; the qualities of the fittest must survive superabundantly his own fleeting existence if the struggle and the survival are to produce any good effects on the race. The bequests of some investment income to a man undoubtedly enables that man to be freed from some of life's cares, and in that sense to devote himself more closely to his pursuits, and to make him more fitted to survive. The qualities that brought about the original accumulation have had social advantages, and the reflection of those qualities is in their tangible objective results *plus* the subjective capacity for continuation of them. Whether qualities are inherited in a great measure or a small, and whether they are important as economic factors, I am not greatly concerned, for such inheritance, so far as it is a fact, is unalterable, and I am pursuing this subject more with its bearing upon practical social action in mind. So if biological

inheritance is marked and substantial, the argument for transmission of accompanying wealth may be relevant. But if biological inheritance is wayward or unimportant, the bequest argument, however closely knit to such heredity, has certainly no *greater* force. Suppose that it could be shown that only in one case in ten thousand does the distinctive personality of a parent descend to his son. Then, even if the argument that objective extensions of that personality should not be separated from it were fully valid, it could only apply to one case in ten thousand. Moreover, even if the biological descent were effective one hundred per cent., the doctrine does nothing to support freedom of bequest or primogeniture or the British ideas at all. If the argument has any validity, since every child would share its parents' personality, every child should share the parents' wealth, and the doctrine leads towards family diffusion of fortunes on the Continental principle of legitime, and would discontinue all bequest out of the direct blood descent, to collaterals, etc. Besides, even in the direct line any force the argument possesses is greatly weakened. If a man can claim on biological grounds his inheritance of ability from a great-grandparent to be a merely fractional part, qualified and diffused by his inheritance from seven other primary sources, then his claim to rank superior to the rest of the community for the inheritance of the whole of the wealth is equally tenuous. Nevertheless, the biological argument may have some economic " point " so far as the first generation is concerned, mainly when it is viewed in its eugenic setting, *Heredity in genius exists to a definite extent, and this fact has economic value to the community*, since, if one dare put a qualitative aspect in quantitative terms, a community of 100 persons of n degrees of ability *plus* one with 100 n degrees, will reach higher economic levels than a community of 101 persons each with $n + 1$ degrees.

The starting-point of any consideration of the inheritance of ability is Sir Francis Galton's great work on " Hereditary Genius," published in 1869, and recently quoted with approval by the Whethams in their book on " The Family and the Nation," in which the most recent eugenic and

biological views confirm Galton's works. Galton found that the proportion of eminent men in the population—that is, eminent in the sense of having manifested unusual ability—was about 250 in the million, or about 0·025 per cent., and it was found that the chance of the son of a man of great ability, such as a judge, himself showing great ability, was five hundred times as great as that for a man taken at random. (One must refer to these works to see the effect, upon these chances, of marriage with an able or an ordinary woman respectively.) The Whethams state as a conclusion : "As long as ability marries ability a large proportion of able offspring is a certainty, and ability is a more valuable heirloom in a family than mere material wealth, which, moreover, will follow ability sooner or later."

They say :

"Since the assumption of the responsibility of offspring falls on those of the younger generation whose financial position, even in the upper classes, is usually not yet secure, it should become an increasing habit for the older generation, where they have it, to distribute a substantial part of their property during their lifetime. Such a distribution should not excite the animosity of the Chancellor of the Exchequer. Security or affluence often comes too late to make easy the heavy burdens of early maturity, and when it comes provides but bitter reflection over lost opportunity. Those in the prime of life can make the best use of wealth in the service of the nation. May each generation as they grow older learn to relinquish it in time to watch their successors meet their responsibilities fully."

Let us assume that the peak responsibility of the average married couple is reached at a period in their lives when they have not got to their highest earning power, and that they could do better for their families—educate them better, and bring them up in a superior style—if they had some assistance from outside.

There could be no better eugenic or sociological institution than a kind of moving annuity which should pass from generation to generation, not at the death of each person, but from him to his children at a point when his personal need for it has become less, and when his son's need for it has become greatest. The inheritance would not, therefore, be

one passing at death, but would be one passing at middle life; it would be like a permanent endowment of the family at its most difficult periods, and there could be no more honourable object of ambition than to endow one's family and descendants in this way, because it would be of the highest eugenic value to the community. In middle life a man cannot both save for his old age and retirement and also spend the best of his income upon his family. It is here that the inheritance from the previous generation, coming at an earlier date, would enable him to be sure of this fund in time, and to save his own surplus towards his own old age, after he had passed on what might be called the succession to his children.

What, however, is the upshot of a "survey" of the biological side of inheritance upon the economic aspects of inheritance of wealth without a more minute analysis of its trend?

The more we survey the biological field the less do we find justification for inheritance of wealth by others than direct descendants or dependents. On the other hand, it does seem to me that we derive considerable support for the orthodox view that the power to make bequests in the direct line is an important economic factor in the accumulation of capital and in great personal effort. It does not, indeed, justify that kind of *inter vivos* giving, which means the escape almost on the deathbed, or within three years from it, from the Chancellor's net, but it *does* support the scheme of transmission of wealth in middle life as an economic factor of some importance, and a worthy use of accumulated wealth, which cannot be regarded as a net toll upon the community in view of its indirect contribution to the community. The argument, of course, spends its force as generations go on.

XII. Conclusions

It will have been seen that the answers we have to the critical questions put at the outset vary in completeness and conclusiveness, and that in certain fields fruitful research

is possible. Certain elements that have at one time been highly significant are now of less importance, while others are emerging.

My own present views, which, of course, are provisional in the sense that they are open to modification as new facts emerge and as analysis reveals tendencies not previously put into the balance, are as follows :

1. In the past century unprecedented economic advance has been due in the main to the greater use of invention and fixed capital. This has, in turn, made new accumulation of savings possible, and has been made possible by the growing fund of accumulation. In this accumulation the principle of inheritance or bequest has played an important part. Where there has been freedom from the shackles of a family diffusion system the greater progress has been possible. The individual motives which are operative under such a system are stronger than ever, but operate over a diminishing part of the field; they are also stronger over a short period, and of diminishing effect over a long period of time. In other words, communal saving *via* company reserves (not subjected to the individual volition for saving against spending) and *via* repayment of debt through funds derived from taxation, and *via* large capital efforts (housing, etc.) partly financed through taxation, is an increasing proportion of the total. Although some of the values set up by such collective sums may figure in individual estate values, they are not created or destroyed by interference with, or promotion of, the right of inheritance.

2. The remaining considerable section of capital accumulation is still powerfully affected by inheritance rights, and would be more affected than heretofore by interference with rights in the direct line, though less affected than hitherto by rights out of that line. More considerable changes might be made in the *width* of the rights than hitherto without seriously affecting accumulation. On the other hand, the time element is changing—accumulation is just as sensitive in the immediate provision and immediate rights of family enjoyment, but less sensitive to change (by restriction or encouragement) in the most remote rights.

3. The sense of "social injustice" is directed against

inequality of wealth, of which inequality through inheritance is not now the larger part. This sense, if limited to inheritance features, has less economic reaction than is generally supposed. In any case, it is a sense which is not scientifically based. I think it probable that, through the inequalities due to the system in which inheritance has a part, the average man has a slightly smaller *proportionate* share of the aggregate than he would have had if there had been no inheritance system, but a substantially larger *absolute* amount, because he shares a larger aggregate or better standard of life than he would have had under a system with no such aid to accumulation. Whether under these circumstances he is justified in having a sense of injustice, whether it is better for human welfare to have a low standard without envy, or a higher one with envy, is a matter lying beyond economics in the sphere of social psychology and philosophy.

4. The particular claims for unlimited rights of bequest, as settling the best economic direction and control, are gradually losing their force.

5. The principles upon which death duty taxation is at present based, though they may be the best available when administrative aspects are included, might be improved upon by closer regard to the foregoing analysis. The actual sum now being raised is not necessarily more harmful economically than a similar sum raised by additional income-tax, but it is more repressive in accumulation than the same sum would be if a less amount were raised at lower rates on the first succession and the balance were raised at higher rates on succeeding successions.[1]

[1] The practical aspects are discussed in the *Statistical Journal*, March 1926.

ADDENDUM I TO CHAPTER II

THE INFLUENCE OF DEATH DUTIES ON INEQUALITIES OF WEALTH DUE TO INHERITANCE [1]

It is of importance to consider, from the point of view of British conditions, the ideas of Professor Rignano upon the effects of death duties on the socialisation of wealth. Those ideas are, at any rate, sufficiently novel and, if acceptable, sufficiently important, to warrant a deliberate judgment. Moreover, it is by no means to be thought that what may be good in one country is necessarily satisfactory in another with different traditions and constitution. Again, it is by collective convergence of thought from a number of different viewpoints, rather than by the wishes or inclinations of a single class, that such a judgment can be formed.

Death duties on their present principles in this country have now existed for over thirty years, but the severe progression in their rates is of more recent establishment. In each instance fiscal needs, rather than any conscious political desire to interfere with liberty of bequest, or to redistribute wealth, have been the prime factor towards change. It is doubtless possible on general grounds of equity and justice in taxation alone to justify a considerable degree of progression, but it is by no means certain that the general assumption that the effects are leading ultimately to the greatest common advantage is going to be made good. The saving of capital resources for increased production, with a growing population, is a most vital element in our social economy—doubtless at its point of maximum benefit if the saving can be made widespread and general, but by no means to be gainsaid or dispensed with even if the saving should be " registered " in the name of but a few. The nineteenth-century acquiescence in the extreme personal accumulation of riches on the tacit condition that the owner did not himself enjoy, by consumption, the interest or produce,

[1] Extracts from the Preface to the English Edition of Rignano's " Social Significance of the Inheritance Tax."

but " turned it in " again into the productive field, has been eloquently described by J. M. Keynes as an essentially unstable situation. But the process, whether right or wrong, did at least raise the national productivity and standard of life of the whole community in unexampled fashion. In so far as high progression in taxation interferes with the old rate of capital accumulation, it prompts two very critical questions in the general social interest :

(*a*) Are those sections of the population whose saving capacity is not impaired by high taxation, *i.e.* in whose favour wealth is being redistributed, taking the place of those who are being heavily taxed as savers and, by a multiplicity of small savings, providing the requisite capital accumulation ?

(*b*) Has the incentive to saving, owing to heavy death duties, on the part of those with considerable incomes, been impaired ?

If the answer to (*a*) is found to be negative, and to (*b*) affirmative, we may well conclude that the future accumulation of capital is in serious jeopardy. Statistical indications in the first case are scanty, but as far as they go they lead to the view that, important though the savings of the lower classes may be, they are not adequate to " fill the gap." As regards the second point, either the incentive to save is seriously affected by death duties, or those duties are actually avoided by the distribution of wealth during lifetime. We have the dilemma of either a social or a fiscal evil.

Professor Seligman, in his introduction to the American edition of Rignano's " Social Significance of the Inheritance Tax " says :

" The new feature in Professor Rignano's ingenious suggestion is that the graduated principle of taxation, which has hitherto been applied only to the amount of the inheritance and to the degree of relationship, should now be extended, in the interests of society as a whole, to the time or the period when the property was acquired. Professor Rignano, in short, contends that while all the property acquired by an individual during his life and by his own exertions should be virtually free from taxation, that part of the estate which he has inherited from someone else

should be subject to heavy taxation. By increasing the rate according to the degree or time of acquisition, the result would be an automatic turning over to the Government of a continually increasing fund of capital. The author endeavours to attenuate the radical implications in his suggestion by emphasising the fact that, in his opinion, this will strengthen rather than weaken the incentive to work, to save and to accumulate."

Professor Rignano's work appeals to three different classes of thinkers. First, it is of interest to those who regard death duty taxation as a valuable part of our fiscal system, but who would like to be able to raise an undiminished sum on principles which will have less harmful economic influences either upon savings or in the direction of fiscal avoidance. For example, Professor Pigou says: "If the various technical difficulties that present themselves could be adequately dealt with, it should be possible, by the Rignano plan or some variant of it, to raise a substantial revenue from rich persons without restricting savings even so much as they are restricted by the existing system—indeed, there is much force in the contention that his plan would actually lead to an increase of saving." [1] Secondly, it will appeal to those who regard death duty taxation in the ordinary course as "eating into the national capital"—an attitude which, as I have shown elsewhere, may easily degenerate into pure fallacy—but who would willingly raise as much as possible by inheritance taxes *for the redemption of debt*. Thirdly, it is directed to those who would use the fiscal engine for purposes *beyond* the fisc, and avowedly for socialistic aims, either to redistribute individual wealth or to accumulate State wealth.

It is not necessary for one to share Professor Rignano's ambitions under the third head—indeed one may be quite hostile to them—in order to assess the value of his principal idea for the purposes of the first two objects above mentioned. One may be entirely out of sympathy with his desire to secure progressive socialisation of wealth, and yet look, in the milder application of his principle, for some amelioration of the economic drawbacks of the present taxation system.

[1] "Economics of Welfare," p. 676.

For example, Professor Henry Clay [1] illustrates the principle by a scale of 20 per cent. at the first transmission, 40 per cent. at the second, 60 per cent. at the third, 80 per cent. at the fourth, and 100 per cent. at the fifth. In other words, the fate of an estate built up at the present time to £2,000,000 and being left every thirty years under existing rates and under such a scale as Clay suggests, would be respectively as follows (ignoring legacy and succession duties) :

Amount of Estate left after Transmission

	In 1940.	In 1970.	In 2000.	In 2030.	In 2060.
Existing method and scale . . .	£1,200,000	£816,000	£587,520	£434,775	£330,429
Rate per cent. . .	40	32	28	26	24
Rignano method .	£1,600,000	£960,000	£384,000	£76,800	Nil

It will be seen that the Rignano scale, while much less severe to begin with, would in 75 years' time leave less than the existing scale, and in 135 years' time would extinguish the present £2,000,000 estate, while the existing British system would still leave £330,000 of it to the fifth successive inheritor.

In considering his ideas we have to answer three questions :

1. Are they *prima facie* "unnatural"?
2. Are they against fiscal or economic principles?
3. Are they administratively practicable?

Is complete freedom of bequest a natural right? Is death duty taxation an interference with that right?

Although some have attributed the growth of death duty taxation to the spread of democratic ideas, it is at least arguable that this apparent connection may not be due to a conscious democratic mastery of the political theory of inheritance, so much as to the force of example in the search for new sources of revenue to meet an increasing growth of expenditure which depends not on the form of Government so much as on the growing economic complexity of the modern State. Or at any rate we may say that the need for

[1] "Property and Inheritance," p. 33.

money has acted as an incentive in the search for an appropriate political philosophy. Nevertheless, there are striking instances where the observation of the results of the principle of inheritance in the modern State has prompted the idea of State restriction by the engine of finance and where the raising of revenue has not been the immediate objective. Thus three great Americans in a short period of time unite on this line of thought; Taft regarding it as one of the ends of Government to make the State share largely in the accumulations it has helped to bring into existence; Roosevelt being desirous of making it impossible for an enormous fortune to be handed on to a single individual; and Carnegie finding it difficult to prescribe a limit to the extent to which the State should go in sharing a rich estate.

When taxation is levied upon *things*, in a general belief in diffusion of incidence, quite different considerations arise as compared with its imposition if it is regarded as falling upon persons. The more advanced fiscal conception, that, however much taxes may *appear* to be levied on things, they are actually paid by persons, leads to more elaborate ideas in taxation. For the thing or the property, the tax *in rem* can clearly not be complex in character. But the individual is so various in his circumstances and in his relation to the property, that there is room for a wide variety of rates and scales. When property passes at death one may think chiefly of the personal circumstances of the deceased and the amount of wealth which he is privileged by the State to will by personal direction, that personal direction being protected and backed by the whole force of the State's law and order. One can look *from* whom it goes, or one can look *to* whom it goes. The personal circumstances of the recipient who benefits by the bequest, whether he be rich or poor, and whether the amount coming to him be large or small—these are factors which may serve as variants in a scheme of taxation. Or, again, one may consider the *distance* which the bequest has to cover, measured in the nearness or remoteness of kinship. It may seem a less remarkable service for the State to perform when it protects the passage of a man's wealth to his widow or his sons, than when it secures the

more artificial rights of a distant relative or complete stranger. It may seem, again, that the element of expectation on the part of a distant relative should be so much less, his surprise so much more, than that of the immediate family, that the State could, without hardship, call upon the former for a more substantial sacrifice. In fact, it will be found that schemes of inheritance taxation in different countries are based on one or other of these principles, and frequently blend two of them. The factors which determine the basis have sometimes been mere historical accidents, but more often the determining causes are to be found in the prevalent ideas either on the principles of taxation or the political theory of inheritance.

It is instinctive for the people of any one country to look upon their ideas concerning inheritance as the normal or natural ones. If, indeed, they are conscious that different ideas and practices prevail elsewhere, they regard them as abnormal, at any rate as being so much less " natural " as to require justification. As a matter of fact, political ideas upon this subject are so varied as to show clearly that there is no one nation which is inherently right, either in the nature of things or by demonstration from political theory.

In the philosophical theory of property held by Locke, he regarded the English freedom of bequest as a natural right. But even in his time the right was limited, and the power to will lands had only recently been conferred by Statute. In intestacy then, as now, three different systems prevailed in England, for, in addition to the general primogeniture, the principle of equal division (Gavelkind) obtained in Kent, and in other places the custom of Borough English gave the property to the youngest son.

" Locke would probably have urged that these were modifications of the law of nature introduced by the State-made or civil law which derived its authority from the social contract. But it is not apparent how the contract, the obligation to keep which itself rests upon a principle of natural law, can override other laws of nature which are (according to Locke) as sacred and absolute as the law that contracts shall be kept." [1]

[1] Rashdall, " Property," p. 45.

One branch of the theory of property conflicts with another. "The rights of property supposed to be derived from a man's natural right to the fruits of his labour, involves the negation of that right in the non-inheritance of property." The same writer concludes: "I am myself disposed to think that the institution of property cannot bring with it its full advantages economic, moral and social, without *some* form of capitalisation and *some* rights of inheritance, however much these rights may be curtailed by the State."

Dr. Dalton has very well said:

> "Most Englishmen who have not studied comparative law will think it natural that the ownership of their property after their death should be governed by their last will and testament. Most Frenchmen in like case will think it natural that the operation of their will should be subject to the law of the Legitime. But many Indians, far from thinking the disposition of property by will to be natural, will find great difficulty in understanding what the mere idea of a will signifies and implies. Indeed, Maine has pointed out that to the vast majority of mankind throughout recorded history the idea would be quite incomprehensible."

The right to direct the ownership and use of property after a man's death is not found in early communities, nor could it be expected where ownership is in common by the family or by the tribe. Its origin lay not so much, however, in full individual ownership during life, as in religious belief. Maitland says that as late as the sixteenth century the right of bequest was the power to purchase the repose of their souls. Intestacy was an ecclesiastical rather than a political affair. In England the right is by no means absolute, for a man may not direct that his property shall be wasted, nor can he direct a perpetual accumulation, nor a succession of ownerships after him beyond a period of twenty-one years after the death of persons alive at his own death. But his right of disposing of his property extends to practically the whole of it, and, with insignificant limits, he can ignore all those who appear to have most claim upon him. The British-speaking peoples, in the main, have similar ideas, whether in the Dominions or in most of the United States. But in continental countries the practice, of course, is quite

different. Close relatives have definite rights. Even in the United States a widow is generally entitled to one-third of the personal property and a life interest in a third of the real property. In Italy one-half of the property follows a settled rule, independent of the desires of the deceased owner, and in France the power of free disposition is confined to a fraction which diminishes with the number of children, *i.e.*, if there are eight children, the right of bequest extends only to one-ninth of the whole.

In Russia inheritance was abolished for a time, the property vesting in the State, subject to certain provisions for supporting dependents at the direction of local tribunals. But total abolition was repealed by the law of March 1st, 1926. Now only descendants have the right of inheritance by law or by bequest. Bequests to collaterals or ancestors are invalid, the only exception being the right to bequeath to anybody any amount which has been deposited in a savings bank or a co-operative bank, and life policies in the State insurance office. This privilege has been granted in order to stimulate this kind of deposit and life insurance, and no duty whatever is to be paid for deposits inherited in such cases. For example, the owner of a deposit in a savings bank for the amount of 100,000 roubles (=£10,000) or more, leaves it to anybody by bequest, free of any duty (or insures his life at the State insurance office), but he is unable to leave a farthing to his mother or brother except through the medium of the State savings bank. All the descendants (dependents having no "own income" and *wholly* supported by the deceased person not less than a year before death are considered as enjoying the same rights as descendants, and have the right of inheritance), divide the whole inheritance *equally* unless the deceased person has by will altered the parts to be inherited by individual descendants (or dependents). For example, if there are three sons, five grandchildren and two great grandchildren, the inheritance is divided into ten *equal* parts, and in this respect the practice is similar in principle to the French.

The amount of inheritance is now not limited, but a heavy death duty similar to the English estate duty has to be paid;

an inheritance worth 10,0000 roubles pays an inheritance duty of 18·5 per cent. The bonds issued by the Soviet Government (the national debt at April 1928 was about 1000 million roubles) are free from inheritance duty, as well as from the income-tax; the same rule applies to the deposits in the savings banks, co-operative peasants' banks and insurance policies. The ordinary house furniture (and peasants' implements) is also considered free of duty, and can be inherited free of duty by descendants who have lived together with the deceased person. (Other descendants have to pay the ordinary duty.) Such things as motors, jewellery, etc., pay the inheritance duty. Estates with not more than 1000 roubles (£100) are free of duty. There have been lately in Soviet Russia two cases of inheritance of about £10,000, but, as a matter of fact, only very small inheritances occur as a rule. This is accounted for by the small accumulation under present conditions, and especially through concealment. If there are no descendants (or dependents), the whole inheritance is considered as an escheat, and is taken over by the State.[1]

Nor is there any fixity of idea in point of time in any one country. France formerly had greater freedom, which became curtailed and narrowed down by the Code Napoleon to its present form, and the breadth of practice in Quebec is derived from the earlier form. Britain, on the other hand, had formerly much narrower limits, for until recent times children had fixed rights, and the limitations on freedom of disposition (which still prevail in Scotland) varied in different parts of the country. In York in 1692 the rights were widened to prevent the widow getting too much and to benefit younger children, but in fact they allowed the latter to be ignored altogether. Legal authorities abound in illustrations which show that there is no fundamental or "natural" idea on inheritance.

It is obvious that where a man dies without expressing any wish as to the disposal of his property the rules made by the State may vary very widely, although the common

[1] From information supplied by Dr. Paul Haensel and also from his work, "Die Finanz und Steuerverfassung," U.S.S.R., 1928, pp. 57, 146, etc.

principle is a division between the immediate members of the family, with such special exceptions as the British Law of Primogeniture.

The economic or social effects of these different practices are clearly different. The compulsory division along the lines of the French system is generally supposed to make for a wide diffusion of wealth. It may make for discontinuity in control of production and a lessened production, except so far as this is offset by the advantages of more even distribution. Complete freedom leads, of course, to aggregation of fortunes. One cannot be dogmatic in the abstract, as to the greater diffusive tendencies of the principle of legitime.[1]

The right of disposition is claimed to be a powerful incentive to effort and capital accumulation. Economists have speculated on these influences, and Sedgwick surmised that while limitation of rights would make the testator save less and work less, complete freedom to him would tend to make his inheritors save more and work less instead. But the claims of individual liberty as against State rights can hardly be put so high as to say that the State may not modify the individual's rights by rule so as to give a nearer approach to maximum social advantage. If such interference involves cutting out some of the more remote individual rights by diversion of part of the estate to itself, it is hardly to be regarded as an offence against the natural rights of man, unless in so doing the State goes to such a length as to commit economic suicide by thwarting individual initiative and drying up the springs of social action. Mill's proposal to limit the amount any one person could receive by inheritance might have gone far in this direction. Rignano himself has objected to Mill's proposal that it might make more idlers than complete freedom would do. Dr. Johnson said primogeniture was good because it made only one fool in a family.

The Principles of Death Duties.

Graduation of death duties is now well-nigh universal in advanced communities, but there is considerable diversity

[1] See Dalton, " Inequality of Incomes."

in the results according to the principles upon which the schemes are based. There are four distinct principles:

(*a*) Graduation according to the total amount of the estate.

(*b*) Graduation according to the amount of the *portion* of an estate left to each beneficiary.

(*c*) Graduation according to the relative poverty or wealth of the recipient.

(*d*) Graduation according to the nearness or remoteness of the relationship between the testator and the beneficiary.

The British estate duty follows mainly the first principle, and a large estate is taxable at a very high rate, even though it may be divided into a thousand small portions and left to comparatively poor people.

But the legacy duty, much less onerous, embodies the second and fourth principles. Pitt in 1796 switched over from graduation by amount to graduation by consanguinity, and the latter is almost entirely the most dominant principle. In 1886 Randolph Churchill contemplated revising the death duties so as to rely on the second principle and deal only with the amount of the bequest to a beneficiary.

These different principles find their several types of justification in different doctrines of incidence. Some people regard death duties as a kind of deferred income-tax, so that any arguments for progressive taxation of incomes apply, with moderate directness, to such a deferred tax. The net fortune that the testator leaves would then be comparable with what he would have left had he been subject annually to a higher income-tax. In so far as it is the practice of individuals to provide for the duty by annual payments of insurance (or by *additional* annual saving that would not otherwise have been made), then indeed the duty does assume this character. The simple character of the principle is, however, rather marred by the fact that the accumulation (or insured fund) itself becomes liable to tax, and so enhances the value of the estate, so that the principle involves in practice a tax upon a tax. In so far as the action of the

testator in saving is not affected by the prospect of the inheritance tax, it may be said that the incidence is not consciously upon him. It is said, in consequence, that in such a case it must be upon the beneficiary who receives less than he would have done if there had been no tax. According to the principle of faculty or ability to pay, which is considered to increase progressively with the amount of an individual's resources, it is fair to impose a graduated scale on such inheritances. But to a son an inheritance is an expectation, to a remote relation it is rather in the nature of a surprise or windfall, and windfalls are considered to possess a special "ability to pay." [1] Here we derive the idea of graduation by degree of consanguinity. Again the remote relationship gives far less prescriptive right to the fortune, and the boon conferred by the State is correspondingly greater. Whether we look at the "Privilege" theory or the "Special Faculty" theory, graduation by consanguinity is intelligible.

As a supporting feature of the theory that the incidence is upon the testator, may be taken the view, so commonly expressed in England down to 1907, that the graduated death duties were required in order to round off our whole system—to supply a progressive element in the taxation of income, and to provide a differentiation in taxation between earned and unearned income. In general discussion the death duties were always called in aid to justify the existing scheme of income taxation. But with the advent of a highly progressive scale, and differentiation against investment income, within the scheme of the income-tax itself, this argument for the death duties as a "back tax" is rendered of little importance.

The recent "Colwyn" Committee on Taxation reported as follows:

"On practical grounds we think it is impossible to say that the incidence of the estate duty is uniform.

"If a testator has consciously stinted his expenditure and saved more year by year than he would otherwise have done, regarding the difference solely as a piling up of the tax against the day of

[1] See my "Fundamental Principles of Taxation."

his death, it is hard to deny that the incidence is upon him during his life.

" On the other hand, if the feelings and action of the testator have not been influenced in any direction by the prospect of the duty, the successor is the only person who suffers and the only person to whom the incidence can well be assigned. . . . When one compares the income-tax with the estate duty, regarding the latter as a kind of postponed income-tax, one sees clearly the solidarity of the interests of predecessor and successor. The income-tax, in a concealed way, hits the taxpayer's son as well as the taxpayer himself, and may hit him just as severely. But the damage is separated by a time-gap. In the case of the estate duty the time-gap is bridged, and the damage is at once apparent. On the whole, we think we have good support for giving primary but not exclusive place to the notion that the incidence of the duty is on the predecessor."

Death duties applicable to the property as such have been justified on the *diffusion of wealth* theory. The distribution of wealth by the appropriation of accumulated wealth is said to require " no further justification, seeing that such taxation provides not only a direct link in a chain towards effecting in an ordered and lawful manner that narrowing of the gulf between the very rich and the very poor which otherwise, perhaps, might only be bridged by political revolution, with all that that involves; but also a means by which the very rich are enabled to pay to the State, which has nurtured and protected them, some part of the great debt which they are alleged to owe but to be unable ever adequately to repay." [1] But this involves the whole question of the extent to which the State may legitimately go beyond necessary State expenditure in the direction of so-called " amelioration " of conditions, and begs the question that a more even distribution is actually in the long run an amelioration of social conditions. Many economists consider the disintegrating effects of interference with the legitimate ambitions of the saver of capital far outweigh, even in a commercial or social sense, any immediate advantages of equalisation.

The next principle called in aid has been the " cost of service." But this would lead to a progressively smaller

[1] Soward and Willan, " Taxes on Capital."

proportion being charged upon the larger estates, and is therefore, by practical application, out of court.

Pierson proposed to recognise both relationship and faculty by dividing the rates of tax into two parts, the first attributable to consanguinity, and the second to " ability to pay " treated as an amplification of the income-tax. Another theory, the *sequence of inheritance theory*, finds its origin in the teaching of Bentham, linking fiscal principles with the law of inheritance. He proposed to limit the power of disposition to distant relations, and to extend the law of escheat, and thus throw larger portions of intestate estates into State ownership. Professor Seligman says it was but a step to the juster and more practicable scheme under which the State takes but a small part from property left to direct relations and an increasingly large sum from remote relations. The French carry the principle to the point of having heavier rates in the direct line, *i.e.* grandchild or grandparent paying more than child or parent.

Professor Rignano adds to these several principles upon which progression may be based, progression by *distance of time* or *number of successions*. This may operate by itself or in conjunction with the others. For example, a certain *scale* of rates applicable to certain amounts of fortune might be increased by x per cent. when the beneficiaries are of a second degree of relationship, and the resultant scale might be increased by y per cent. where the fortune is being left by a person who himself inherited it.

The last and perhaps the most vital aspect for consideration is *practicability*. This detailed treatment would lead me too far afield. But I may at least outline the chief headings of such a consideration :

(*a*) Changes in the value of money, or rate of interest, where the same real fortune may show a fictitious increase or decrease for taxation purposes.

(*b*) The succession of life interests.

(*c*) Changes in valuations of variables, etc., such as mines depending upon an estimate of length of life.

(*d*) The impossibility of stereotyping the forms of

wealth received as inheritance and of holding to original valuations where the forms into which exchange has been made exhibit changes.

(*e*) Rapid successions horizontally along the same generation, *i.e.* from brother to brother.

These questions are too technical for a general treatment, but upon their successful solution rests the practicability of the " Rignano " scheme in British conditions. A valuable contribution to them has been made by recent papers and discussions in the *Journal of the Royal Statistical Society*, and the report of the Colwyn Committee on Taxation and the National Debt.

ADDENDUM II TO CHAPTER II

As a consequence of the foregoing address, the following communication was made to the Press :

THE INHERITANCE OF WEALTH

Following upon the Presidential Address in Section " F " of the British Association at Oxford on " Inheritance as an Economic Factor," a Committee of that Section was formed to explore the possibilities of statistical research on the subject. The Address showed that the extent to which the average fortune is made up of inherited wealth as against wealth made and saved during the lifetime of the holder is quite unknown, nor is it known whether any considerable change in the proportion is in progress. It is not clear how far fortunes on disposal tend to split up and go lower down the scale of distribution of wealth, or to appear, in the opposite direction, re-aggregated in larger fortunes. There is no good evidence as to the difference in the economic results of the widely varying systems of bequest existing among the Anglo-Saxon and Latin races respectively. Much confident and contradictory guesswork exists, but no such

adequate basis of facts as would be really valuable to political science is available. These questions are not academic merely, for the reactions of taxation policy and political theory alone are sufficient to give them practical interest during the next generation.

The Committee decided to approach the matter by the collection of specific instances of bequest in a "random" sample, which it is hoped will be sufficiently large to give, with scientific treatment, significant results. Anyone who has direct personal knowledge of an estate of £5000 or upwards, and who has, for example, information of the extent (if at all) to which its accumulation during the lifetime of the deceased person had been assisted by bequest, etc., is invited to apply to Mr. R. B. Forrester, London School of Economics, Houghton Street, Aldwych, London, W.C. 2 (Recorder of Section "F"), or myself, as Chairman of the Committee, at the same address, for a standard form on which the details can be recorded (without necessarily revealing the identity of the deceased person). The value of the sample must depend upon the readiness with which executors and others will voluntarily give their help to an inquiry conducted on scientific lines without partisan aims.

J. C. Stamp.

The form supplied to applicants is appended hereto, and further contributions to the collection of cases are invited.

CONFIDENTIAL

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE INQUIRY ON INHERITANCE

As a result of the discussion raised by Sir Josiah Stamp's Presidential Address last year, a committee was appointed by Section F of the British Association, with a view to exploring the statistical aspects of Inheritance, so as to obtain a clue to its importance as a cause of inequality of wealth.

It appears to the Committee that an important source of information may be found in direct personal knowledge of instances of bequest. They therefore seek the assistance of those interested and in touch with such information, who are requested to give the quite anonymous information asked for on the form below. It will be sufficient to reply briefly under each clause of the form : *e.g.*, " No. 3. Not more than £10,000." Returns should refer only to Estates of £5000 or over.

The signature of the sender should be so placed that it can be easily detached and destroyed.

Replies should be sent to the Recorder, Mr. R. B. Forrester, at the London School of Economics, Houghton Street, London, W.C.2.

FORM OF RETURN

IDENTIFICATION NO.....

1. I had direct knowledge of a person who died in the year at the age of and whose whole estate was valued at £ (Indicate sex and whether the person is married, single or widowed, and, if possible, the occupation and the amount of settled property.)	
2. The income of the deceased was derived mainly from (*a*) Earned income. (*b*) Investment Income. (i) Land, Buildings, Property. (ii) Stocks, Shares, Securities and other investments.	
3. The amount received by the deceased during his lifetime by way of inheritance or bequest, was, to my knowledge, not more / less than £ (Add any more precise details known, *e.g.* age of deceased when such amounts were received, and whether from parents, own children, collateral relatives, or strangers.)	
4. The amount alienated by the deceased during his lifetime by way of gift, settlements, etc., was, to my knowledge not more / less than £	
5. The disposal of deceased's estate was as follows : (If possible state % going eventually to the direct descendants, if any, to other relatives or to other purposes.)	
6. Give any supplementary information which seems important (*e.g.* the ages of the respective legatees, and their probable personal fortune, if known, relation to deceased, and, if possible, the portion of the Estate whch was held under life interest, and the disposition of which was settled previously).	

IDENTIFICATION NO.....

Please give name and address. This portion will be torn off as soon as the form has been scrutinised.

III

INVENTION

III

INVENTION

I. Introduction

I did not know until after I had chosen my title [1] that Sir James Henderson would take as his subject for the Presidential Address before the Engineering Section of the British Association at Leeds "Invention as a Link in Scientific and Economic Progress," otherwise I might have hesitated to embark upon one so closely allied. I do not, however, choose a subject necessarily because I think I know a great deal about it, but rather because I have, at various times, put myself questions to which I do not know the answers, and the choice of a title to cover them forces me in the meantime to find the answers if I can, or at any rate to determine the limits within which answers are in fact likely to be available, and the area over which detailed or *ad hoc* inquiry is necessary before satisfactory answers can be completed. Now, in the main, the questions I had set myself to ponder were not touched by Sir James Henderson's paper, and valuable and suggestive though I have found it, the ground covered is on the whole rather complementary and adjacent to mine, than identical with it. Speaking generally, he was more concerned with invention as such, in the making, and its progress and fate to the point of its complete scientific efficacy. I am more concerned to deal with its career after that stage, and the nature of its effect on economic society.

II. Two Types of Economic Society Contrasted

Let me sketch two possible extreme types of economic society, one sympathetic and the other antipathetic to the

[1] "Invention as an Economic Factor." Watt Anniversary Lecture, 1928, at Greenock, March 9th, 1928.

introduction of inventions in its midst. In one the organism is resistant to change; an inventor if obscure and without resources has to hunt round, even after he has completed his invention, for a sympathetic listener who can vouch he is not a crank, and that vouching must carry weight in the right quarter, where finance can be mobilised to introduce the idea to industry; and that finance must have staying power while the idea gains momentum. There may be many vested interests against the changes involved: in the manufacturers who make the instruments that will be supplanted; in the user who has much capital in such instruments that would be rendered obsolescent; or in the skilled labour that may be displaced or affected; or the public may be so wedded to a particular type and so conservative that long and painful education is necessary to create a demand. These interests resistant to change may be so powerful that only the most striking improvements can overcome them. The invention that survives the first obstacle and finds a sponsor who scientifically is adequate, may fail at the next difficulty, when capital at risk deems the shot too long; or it may find the capital, and then the shot actually proves too long. Every invention is born into an uncongenial society, has few friends and many enemies, and only the hardiest or luckiest survive. There are some remarkable passages in Jeremy Bentham's "Manual of Political Economy," first published in 1839, Chap. III, in which he draws a very moving picture of the inventor and his temperament struggling to introduce himself into a society thus adverse. Writing some twenty years before legislation for Joint Stock liability, he is criticising the then existing conditions: "An inventor, therefore, in want of funds can only apply to a tradesman or merchant to enter into partnership with him; but persons engaged in business are those who have the least portion of disposable capital, and as they are enabled to make their own terms, inventive industry is often stifled or oppressed." [1]

[1] Bentham also makes a quaint suggestion: "Were it lawful for everyone to engage in commercial undertakings for a limited amount, how many facilities would be afforded to men of genius! All classes of society would furnish assistance to inventive industry: those who wished to risk

Now contrast this with a society organised for change, welcoming invention with both hands outstretched, with the economic machinery for quick and competent recognition of final values, with the rails of finance ready greased for all such recognition to run smoothly into the very heart of industry—finance specialised for risk-taking and years of development. These risks and deferments are reduced to a minimum, because we postulate manufacture receptive of innovation, labour acquiescent because individual costs of dislocation are a charge upon the social benefits of change. Once a change is seen to yield a net advantage to the community and to be desirable, all energies are bent on making it a success at the earliest possible moment.

III. Some Questions

Now some of my questions are :

1. What would be, in the long run, the difference in the economic progress of the two communities?
2. Do they necessarily involve the difference in principle between individualism and *laissez faire* on the one hand and socialism on the other?
3. Do existing economic communities differ in degree in resistance or acquiescence at this moment along those lines to an extent which makes an economic difference? If so, in what particular directions are these differences? Can they be altered? Ought they to be altered?
4. Has any existing economic community over a period of years developed from one to the other, and with what consequences?
5. Apart from the "lag" in taking up new ideas, is there

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only a small sum—those who could annually dispose of a certain sum—would be enabled to engage in this species of lottery, which promised to yield them an interest above the ordinary rate. The most elevated classes might find an amusement in descending into the territories of industry, and there staking a small part of that wealth which they risk upon games of chance. The spirit of gaming, diverted from its pernicious direction, might serve to increase the productive energy of commerce and art."

any ultimate difference in progress from the two different attitudes?

6. What does invention actually do, in economic life, and are all types similar in effect?
7. Can the economic life react upon the scientific progress of invention?

I cannot in the course of this essay answer all these questions, or even lay out the information that may be available towards them. But I propose to attempt some definition and measurement; some illustration; some indications of the present trend of influence; and some glimpses of the way in which an economist looks upon them. First of all, then, it is no good trying to deal with invention as an economic factor unless we construct a manageable definition of invention for that purpose.

IV. Invention and Discovery Distinguished

In his address Sir James Henderson dealt mainly with the great inventions which are necessarily complex, and do not lend themselves to neat classification of birthday and majority. The wireless, with its distinguished, but indistinguishable, paternity of Maxwell, Hertz, Lodge, Crookes, Branly, Marconi, Jackson, Fleming, de Forest and the efforts of the Admiralty, is a special example of the difficulty of determining constants for comparative purposes. He distinguishes between discovery as the tangible increase in man's knowledge of nature and its complexities, and invention as material application. Admittedly in the "majority of cases an invention is in its origin a mental conception, it is a conception of something material and practical, while a discovery begins and ends in the realm of the mind." Nowadays capital is necessary not only for invention, but also for discovery. "The Einstein Theory, for instance, could never have been tested and established without the assistance of capital to finance the extensive eclipse observations which converted it from a pure mental conception to a working theory."

In one way the first point at which invention touches economics is its demand for finance, even in the inventive stage. As Sir James Henderson says :

" We are often told that the financial world of to-day worships above all things a fat and speedy dividend, but when one thinks for a moment of the amount of capital that must have been spent, often fruitlessly, in financing the discoveries and inventions of the past, and realises at the same time the number of other channels open to finance in its own immediate sphere, offering possibly greater certainty and speedier returns, it is surprising, not that it is so difficult to obtain finance for a pure scientific invention, but rather that it is possible to find it at all. It says something for man's imagination that finance, with its many other opportunities, is willing, even to a limited extent, to place its resources at the disposal of scientific progress in the courageous belief that it is casting its bread on the waters of knowledge and that in good season it will return."

V. Scientific and Industrial Periods of Gestation

The period of SCIENTIFIC GESTATION I take to be the time elapsing between the first conception of the idea and its public presentation to society in a form that is substantially the form in which it ultimately finds extensive use without important modifications. I am not greatly concerned to give more precision to this definition. The period of INDUSTRIAL GESTATION I desire to mean the time elapsing between the end of the scientific gestation and the date when the innovation has in an economic or industrial sense " arrived " or been fully accepted. Now if we are to have any comparative measures available as between different generations, or different countries, or even different types of discovery, this idea must be given greater precision, especially as to its terminating date. The date when a thing is available on the market and publicly known is reasonably ascertainable, but the date when it has economically justified itself is less determinate. A slightly different definition is necessary for different orders of invention. In the case of a relatively minor improvement integrally embodied in a large or costly machine, it is obvious that the extra advantage does not justify or compensate the

immediate abandonment of all the machinery, much of it quite modern, that is without it. The invention has "arrived" immediately it does all that can be economically justified by it, that is, as soon as it FILLS THE RENEWAL PROGRAMME. In other words, as old machinery is worn out and requires replacement, if no one would think of renewing it without using and taking advantage of the improvement, the invention has "arrived," even though it may not be a fully remunerative proposition to the patentees or suppliers. (This period of economic saturation in use which is subnormal in financial result, I allow for in my factor of "deferment," to which I refer later.) I do not suggest, of course, that such improvements should wait for the slow petering out of the old types of machinery and the lapse of their full normal life. The improved machinery does much to hasten the end of its predecessors. For theoretically, at least, when the advantage of the new over the old in annual net product is sufficient to cover the interest on the capital represented by the written-down value of the old (minus scrap value) it will pay to anticipate the worn-out stage and renew it on account of obsolescence. Thus a manufacturer has a machine with a written-down value of £200 (out of £2000) and a scrap value of £50, and three years' remaining life. Its "net product" (after allowing for its wear and tear quota and for any exceptional repairs through age) is, we will say, £250 per annum. Now a new and improved machine can be bought for £2000 with a *net* annual product of £280. He has an accumulated depreciation fund of £1800 ready in any case. Shall he find, as new capital, £150, and buy the new machine? Obviously the gain of £30 per annum will give the interest thereon, and justify the change. So my first test of "arrival" is when the renewal programme is devoted to the new improvement.

But this test does not meet the case of a new type of supply altogether, *e.g.* wireless sets, whether dependent on new purchasing power or displacing expenditure on other forms of enjoyment. Here economic justification is reached when the supplier is getting a normal return upon his

capital, or rather a return which, in continuity, justifies his outlay of capital as against other rival forms of investment. This requires a little further definition. Suppose the capital is £100,000 and the justified return in continuity is 7 per cent., and the record is as follows :

			Cumulative.
First year loss	£10,000	...	— £10,000
Second ,, ,,	2,000	...	— 12,000
Third ,, profit	1,000	...	— 11,000
Fourth ,, ,,	5,000	...	— 6,000
Fifth ,, ,,	7,000	...	+ 1,000
Sixth ,, ,,	10,000	...	+ 11,000
Seventh ,, ,,	13,000	...	+ 24,000
Eighth ,, ,,	20,000	...	+ 44,000
Ninth ,, ,,	35,000	...	+ 79,000

I do not take my date as the fifth year when 7 per cent. is reached, nor the sixth year because past losses have been recovered and 7 per cent. has been achieved, nor even the ninth year when the results to date make 7 per cent. on the original outlay throughout (ignoring compound interest). I treat the subnormal results of this initial period as essential capital outlay in development, and reckon my period when 7 per cent. on the capital, including deferred yield, is reached. Thus, ignoring compound interest, the capital outlay at the beginning of the second year is :

	£117,000	(Interest required,		£8,190	+ loss	£2,000)
	10,190					
Third year	127,190	,,	,,	8,903	less profit	1,000
	7,903					
Fourth year	135,093	,,	,,	9,456	,,	5,000
	4,456					
Fifth year	139,549	,,	,,	9,768	,,	7,000
	2,768					
Sixth year	142,317	,,	,,	9,962	,,	10,000
	— 48					

At the end of the sixth year enough profit is made to pay 7 per cent. on the accumulated capital, and I should regard

six years as the period of industrial gestation. I do not wish to elaborate this point further, except to say that in computing the rate of interest the two elements, exceptional risk and any final wastage of capital, must be allowed for.

VI. The Influence of the Quality of Machinery

The way in which a new invention comes into practical use is profoundly affected by the question whether it is an article of consumption first hand, like an incandescent mantle or an electric bulb, a new hairpin or stainless cutlery, a wireless set or a bicycle; or whether it is a new way of producing existing commodities, *i.e.* new machinery or modifications of machinery. In the former case we have the psychology of the public to think of—their economic desires; their spending ability; their prejudices; their conservatism; their love of change and fickleness. In the other case we have the economies of manufacture and long-period finance—quite a different set of problems. I will look at the latter class first, as being, in the long run, more important.

If I had to sum up in a word, with no very great accuracy, the difference between the mentality of the American and the British manufacturer, I should say that to the Britisher, alive to the importance of progress and change, the period of reorganisation and change-over in his methods and equipment is the exceptional period which he undergoes in order to enjoy a higher level. The state of stability is normal, the state of change is exceptional. In the case of the American, the state of stability is not so much the normal as a brief period of rest for the next change, and a state of constant change is looked upon as itself normal. Such a difference in attitude of mind naturally has a practical expression in the attitude towards scrapping existing machinery.

Suppose that the machine whose annual output is £100 costs £1000 if it is to last thirty years, but can be made for £750 if it is to last for fifteen years, and that it is quite

possible that an important modification will be introduced within fifteen years. At the end of that period let us assume another machine costing £750 to last fifteen years can be built with possibly an improved output. If no such invention occurs, then A will have spent £1000 in capital to get £100 net a year for thirty years, and B will have spent £1500. But if it does occur, B gets for an extra £500 an annual advantage denied to A. In this calculation we must take into account that the original £250 difference is really much bigger than it looks, since it is an investment by A which only becomes really remunerative in the sixteenth year, and we ought, therefore, to call it £500 at the moment when B invests the second £750. This would be clearly seen if A's terms of payment were £750 down and £250 accumulated at interest in the sixteenth year. A would be paying down £500 for the second half of his machine's life, while B pays down £750 for his new machine. Whether this is good business or not depends upon the proportion which the annual value of an improvement is likely to bear to twice the difference between the initial costs. If initial differences are considerable and if chances of improvement are good in a new or rapidly expanding industry, the odds are heavily in favour of B's policy. Remember that if A goes on for a second half enjoying a lower income than B—that is, lower after taking B's larger capital outlay into account—at the end of the thirty years A catches up again, for he buys a new machine of thirty years' life, which contains two sets of improvements, and is equal in every way to B's third machine, and only in the fourth period of fifteen years will A fall behind B again. (I am only analysing the nature of the difference, and not measuring it exactly, otherwise the calculation must be complicated by the difference in annual wear-and-tear charges in the two cases.) As different individuals in one country will be renewing at different times, the collective lag in all the A's together compared with all the B's together will not proceed in this jumpy fashion, but will have a general average, if not for one industry, certainly for all industries taken together.

It appears *prima facie* probable, then, where two communities are alike save for this difference in their attitude towards invention or organisation for its reception, that the gap between their respective stages of progress will not be a continually widening one, but rather that one will lag behind the other by a fairly constant period of years. This period should not normally exceed the difference between the two average periods of industrial gestation, nor that between the normal actual life of industrial plant in the two cases, and therefore is measured by ten to fifteen years at the most. Community A will enjoy in 1935 at least the standard of life that Community B had in 1920. Of course, in practice all other things are not equal, and differences in natural resources and in population make a profound difference in the level of production (after eliminating the lag) and, therefore, in the level of savings per head, and, therefore, in the capital appliances which embody new invention and its advantages.

VII. Other Reasons for Prolonged Industrial Gestation

It will be clear that the rapidity with which a new invention becomes universal depends to some extent upon the percentage of advantage that it has in relation to the total cost of the machine embodying it. This will be particularly so in a highly developed country where large sums have already been sunk on existing plant and equipment. The field of advance is limited to countries which are starting the processes for themselves. There may be, too, individual reasons: a large corporation like a railway may be chary of a universal adoption of a particular patent, because, apart from the possible danger of having only one source of supply, they may prefer, on grounds of policy, to adopt a specification which can be met by at least a number of large manufacturing concerns who are their particular customers. It may even pay a large vested interest to buy up a patent which, in the hands of competitors, might be a serious menace, but in their own hands can be developed

slowly with their own renewal programme rather than introduced quickly. Look, for example, at the financial considerations which would probably be present in the minds of railway managements faced with new types of locomotives involving new principles. The tests may have shown considerable economies in running costs, of fuel and water, but before any large proposition for displacement of existing types can be brought forward with confidence they need to satisfy themselves not only as to the *prima facie* economies, but also as to the long-period costs of maintenance, the comparative reliability of the engines in service after they have been out some years and their cost of maintenance in the running sheds. Moreover, probably in most instances the new types will be—at any rate until they are in large supply—two or three times as costly as those in current use, and so the net margin of savings has a greater financial gap to bridge with a reasonable return. These are all factors which make the period of gestation to-day longer than it might have been a hundred years ago.

Marshall says :

> " The mechanical inventions of every age are apt to be underrated relatively to those of earlier times. For a new discovery is seldom fully effective for practical purposes till many minor improvements and subsidiary discoveries have gathered themselves around it." [1]

The growth of population and accumulation of capital may be necessary for the invention to thrive commercially—in that case the invention may be ready, but the environment has to grow to meet it.

There are, of course, other respects in which the period to-day is shortened. The much greater means and possibilities of spreading technical information through the Journals and Associations make a wide and instantaneous market for ideas. There are far more adequate means for testing out, and vouching for, the scientific value of proposals, but a very important aspect of this class of innovation is its effect upon handwork and labour generally.

[1] " Principles," p. 206.

VIII. Human Considerations. Labour Views

You will remember that Queen Elizabeth, a "wantonly mischievous" trader in monopolies, exclaimed to Lee, when he brought her an epoch-making invention for knitting stockings by machine (the only considerable British invention before the eighteenth century), "I have too much regard for my poor people who obtain their bread by knitting." Lee took the invention to France.[1]

In the industrial revolution the immediate effects of displacement were obvious, but the ultimate effect on employment of greater individual wealth and of wider demand for a cheaper product had yet to be proved. To-day we have the proved results of the past to urge. There was great delay because the employers introduced new arrangements ruthlessly and the workers opposed them with violence and intimidation. To-day the worker may not express his antipathy with the same ruthlessness, but the owner is more apprehensive of the human effect, both on sympathetic grounds and economic grounds. Which, therefore, is the greater delay—that due to too violent resistance, or that due to a permeation of industry under economic pressure at a rate dictated by the inevitability of gradualness? Obviously, if the change in a given works can be effected in such a way as to maintain or improve wages while at the same time reducing numbers, and the reduction in numbers is made in the main by shutting off the normal "intake" of new workers so that nobody is consciously hurt, then the infiltration of the new ideas is socially painless. But the economic problem of absorbing the accruing new labour is only the same economic problem one stage removed. This aspect needs separate consideration.

After all, the employers in the nineteenth century had a long record of resistance of innovations of a different character which ultimately were not only humane and wise, but also added to efficiency and economic wealth. That egotistic poet, Alaric Watts, in his youthful days as editor of the *Leeds Intelligencer* made a bad start in 1822, and

[1] Marshall: "Industry and Trade," p. 714.

prejudiced his paper by advocacy of the fencing of machinery at factories "which astonished and exasperated the employers." [1]

IX. Some Examples of the Contrast between Scientific and Industrial Gestation—Machinery

I should like to look at a few actual cases, in the past, of the period of scientific gestation and industrial gestation respectively. In the light of what I have been saying, some of the inventions of the industrial revolution are interesting. It is natural here that we should turn to James Watt.

In James Watt's case, the invention period was rather long, and its duration by no means wholly influenced by economic considerations. But the industrial gestation was almost negligible; indeed, there was no period when Watt was waiting, with a completed machine, for a customer. In 1763 he repaired the Newcomen engine. The Newcomen engine, as applied to pumping, had remained "practically without improvement for the nearly fifty years intervening between 1720 and 1769, the date of Watt's patent." [2] In 1765 he conceived the idea of the separate condenser and constructed experimental engines. In 1769 he took out his patent and completed the Kenneil engine. In 1774 the experimental work went on in Birmingham, and it may be said that the invention period took ten years.[3] It is true that Watt was following the profession of civil engineer, but most of the time his mind was busy on the engine, and he did not actually lack funds for models and experiments, with Roebuck's help and, indeed, pressure. The talented authors of the great memorial volume assert, however: "Of the whole period . . . we find that the time spent in the active prosecution was really only a matter of three years in two periods, 1765–1766 and 1768–1770, and even during these periods the work was not uninterrupted. The net result was that the engine underwent a radical change, and assumed eventually the general form of the earlier

[1] "Dictionary of National Biography." [2] *Ibid.*
[3] "James Watt," Dickenson and Jenkin, p. 4.

beam engine, but did not attain complete success even in that form" (p. 106). It appears to be a general view that Watt's want of means retarded the practical outcome and even the application for a patent,[1] and also that Roebuck's financial troubles embarrassed Watt. But when the Boulton partnership began in 1775, and he was in a position to furnish complete engines, demand was always greater than supply, partly because there could be no multiple or mass production, and every installation had to be personally supervised by him with many materials ordered from outside firms. There was certainly no resistance by vested interests. The demand by the industrial market was such that, so far from the investor pressing upon it, he held it back. The extension of his patent from 1783 to 1800 was of doubtful value to industry on the whole.

"While having regard to the first-rate importance of the invention, the monetary reward of the patentees was not excessive, it seems pretty clear that the extension was too great and that it hindered the development of the steam engine in this country. Boulton and Watt, from the first, had refused to grant licences to other engineers to work under the patent; the patent blocked the way of other inventors, and Watt himself had come to the conclusion that there was nothing to be gained by trying new schemes." [2]

The orders from Cornwall began in 1776, the first engine was at work in 1777, and by 1780 forty pumping engines had been set up, of which twenty were at work in Cornwall.[3]

On the financial side, by this date, 1780, Boulton was interviewing his London bankers on his £17,000 overdraft, giving engine royalties as security. In 1784 it was estimated that the dues amounted to £12,000, and there was also the other business of rotative engines mounting up.[4] In 1786 orders were pouring in, and Watt wrote to Boulton: "I foresee I shall be driven almost mad in finding men for the engines ordered here and coming in." [5]

The method of financing the sales was peculiar, and on modern lines it can almost be said that the individual

[1] "Dictionary of National Biography."
[2] "James Watt," Dickenson and Jenkin," p. 6.
[3] *Ibid.*, p. 109. [4] *Ibid.*, p. 63. [5] *Ibid.*, p. 65.

business paid a reasonable interest on the capital *actually involved* almost from the beginning, and by this single test the industrial gestation was short. But if judged by the *spread* of the invention on the widest possible scale, it was prolonged by the inventor's own act. But the same might be alleged of many patents, and we cannot judge fairly by what would happen if there were no patent system.

James Watt's brilliant invention, the copying press, had a different history. Its invention period was short, and its industrial period was lengthy. In April 1779 he makes his first mention of taking impressions, and by September he refers to his "rolling press, which answers extremely well." He spent some time experimenting with inks, but by February of the next year he took out his patent and started a fresh business to work it, and put it into commercial use in March 1780. It certainly saved him personally a lot of drudgery, but the invention was received with distrust and alarm, and was much resisted, especially by bankers, "but the inherent value of the new process forced it to the front, and it remained indispensable for business purposes for a century, *i.e.* till the advent of the typewriter." [1]

It was not until the patent had well-nigh run its course that the opposition gave way before the merits of the system.[2]

Just a hundred years later Watt's inventions led to another whose record we may contrast.

The mere idea of a turbine was 2000 years old, but no one had tackled the problem scientifically and with a knowledge of the properties of steam, and also with the help of tools of precision. The design and manufacture of the first turbine only occupied some six months, in 1885, and by 1890 several hundred had been sold at a profit, and its future commercial success was fairly well assured. In 1892, in fully developed form, it surpassed the reciprocating steam engine in economy, and then its position was a certainty. Sir Charles Parsons has told me that, but for partnership complications, the period of development would probably have been only one half as long.

[1] "James Watt," Dickenson and Jenkin, p. 51. [2] *Ibid.*, p. 364.

Hargreaves first conceived the idea of the spinning jenny about 1764, and did not take long to bring it to the productive stage, for he had supplemented his own earnings by selling some of the new machines to others by 1768, when the old-fashioned spinners gutted his house. On moving to Nottingham, he patented it in 1770, and, immediately after, had to bring actions against its extensive use by Lancashire manufacturers. In 1784 there were at work in England 20,000 hand machines of eighty spindles each and 550 mules of ninety spindles. It may be said that his machine had an immediate entry into the market and filled the renewal programmes. It was " invented at a time when it was urgently needed," for Kay's fly-shuttle from 1760 had doubled the weaver's capacity, while the spinning remained the same.[1]

Cartwright began to think of his problem in 1784, took out a patent in 1785, and the invention stage was over in 1789. His combing machine took from 1789 to 1792—at once a single machine displaced twenty men, and the petitions against it numbered 50,000. In 1791 a Manchester firm contracted to use 400 power looms, but the catastrophe of the destruction of the mill by fire held back others. So by 1793 he had lost £30,000 and was heavily in debt. By 1800 the wool-combing machine was coming slowly into use, and he got an extension of the patent till 1815, but was a loser on it to the last.

In 1804 the patent expired, and he found some manufacturers were profiting greatly by it. In 1809 his House of Commons petition brought him £10,000.

In Crompton's invention, the industrial period was clearly five years, 1775–1780 (from age twenty-two to twenty-seven). As he spun fine yarns with his mule, the demand was immediately " for as much as he could supply and at his own price," and the prying into his secret came at once, and in a few months drove him to make over his invention to eighty manufacturers. The story of their treatment of him and his consequent misanthropy is well known. In 1800 (or after twenty years) the mule had

[1] " Dictionary of National Biography."

largely displaced Hargreaves' spinning jenny, superseded Arkwright's water-frame, and created a prosperous manufacture of muslin, and a public effort was undertaken for him. When Crompton toured the manufacturing districts in 1811 to ascertain the use of the mule before claiming a national reward, he found 4,600,000 spindles on his mules, 155,880 on Hargreaves' jenny and 310,516 on Arkwright's water-frame.

This invention was never patented, but it seems clear that the industrial gestation, within the sense we are now using it, could not have been more than two or three years. One would have to assume that it almost immediately filled all renewal programmes to get such a position of supremacy in twenty years, assuming a life of fifteen to twenty years for the types of machinery displaced.

J. B. Neilson first put out the idea of a hot blast in a paper about 1823, but he had no chance to make proper experiments till much later, and his actual patents were September 1828 and February 1829. An improved apparatus was erected at the Clyde Works in 1830, and I think the period of gestation may be taken as about two years. By 1835 the hot blast was in general use, despite great prejudice in Staffordshire. Although Neilson had to fight at law on his patents, and only had three-tenths of the royalties, he retired in easy circumstances in 1847, having benefited industry to the extent of £12,000,000 annually in the iron industry alone.[1]

Josiah Wedgwood's discoveries were very accurately documented, but they belong rather to the second class of invention, which comes immediately into the hands of the final user and constitutes a new object of spending power. In this class the rules are very different and the period of gestation tends to be much shorter. On the whole, in pottery there was no invention that made a great stride forward directly benefiting the inventor. The trade has been for the last 200 years much more of an evolution. At the end of 1774 one of Josiah Wedgwood's letters says " that from recent experiments he will be able to give a fine white

[1] Mackenzie, " Life of James Beaumont Neilson."

composition any tint of a fine blue." Six months later he is producing them with confidence, and in January 1776 he refers to the fact that he has "completed the Jasper." On February 6th, 1776, he says: "Our Jasper is one of 17 (Flint), Six of 74 (Cawk), Three of 22 (Clay) and ¼ of 20 (Plaster). You can hardly conceive the difficulty and trouble I have had in mixing two tons of this composition and leaving everybody as wise as they were." Probably these went into sale as *articles de vertu* almost immediately. In 1786 we have recorded sales at the London Rooms £1112, including Jasper, Black Basalt and other types.[1]

International competition in armaments, which has such a great influence to-day on scientific development, had little influence in those days. It is difficult to realise that the *Victory* was forty years old when she fought at Trafalgar, and her total cost with armaments and all stores on board was probably not more than £100,000. This comparative resistance to change was not due to her prime cost as compared with to-day, for in 1890 a warship cost ten times as much—£1,000,000—and was obsolete in half the time. The cost to-day may well be £7,000,000, and one hesitates to say what the effective life will be.[2]

X. The Effect of Invention on Purchasing Power

What does invention, after all, actually do, in an economic sense? Henderson says its whole object is "to eliminate the limitations of the human element by giving to man the control, through relay mechanisms, of power infinitely greater than his own and with little or no expenditure of effort on his part." But I should prefer to classify it as follows: (1) to produce existing satisfactions with less human costs, so that men may either (*a*) enjoy more of them for the same expenditure of effort, or (*b*) enjoy the same quantity and divert the released expenditure to other objects, and (2) to produce new satisfactions either (*a*) in

[1] From information received from the Museum Curator at Etruria.
[2] J. H. Barker, "Scientific Societies—A Retrospect and a Prospect."

response to existing wants and feelings or (*b*) in response to newly-created and evolved needs.

Now it is a commonplace of economic theory that human wants along any particular line are easily satisfiable, but not all wants taken in the aggregate. Nevertheless, there is an important point of balance between the two classes of invention which is essential to all orderly economic progress, and to the avoidance of stresses and strains in the economic organisation. Suppose that all invention for a long period were of the first type, producing commodities satisfying existing needs, and continually releasing purchasing power. For a time this released purchasing power would occupy itself in buying more of the settled range of objects, but a time comes when people have as many boots and hats as they can wear, as much bread and potatoes as they can consume, and as many garden rollers or pianos as they need. If no one discovers new varieties of finer foods, new types and qualities of clothing, garden seats and gramophones, or wireless, expenditure on existing lines tends to exhaust itself. This means that the labour-saving devices which have been at the root of this cheapening have freed a number of workers, and no new activities have arisen to absorb them. In economic progress a continually smaller proportion of the population is devoted to supplying a given or fixed range of the population's needs, and the released proportion is supplying either greater quantities or goods previously never thought of. It is obvious that an undue proportion of novelties, employing much capital and many workers in production, can only find buyers, assuming no productive power is being released by inventions in staple lines, at the expense of other luxuries or even of consumption of conventional necessaries. What proportion of inventions are "replacers" of previous types of producing agents or consumption goods, and what proportion are responsible for entirely new wants and human desires? A balance between the two is essential to orderly progress, without unemployment on the one side, or depressed staple industries on the other.

XI. The Reception of New Commodities

Now the second great class of invention puts entirely new products, or greatly improved products, in the hands of the actual consumers. They have fewer influences at work to delay adoption of the novelty, provided it is well advertised and not unprofitable for the retailer to sell. It may, of course, be kept back by—

(1) Efforts of the rival old attractions to keep it off the market.
(2) Conservatism on the part of the public in understanding its advantages.

In general, however, the period of industrial gestation is very short.

The period of scientific gestation for the telephone is, of course, very indeterminate, but it culminated in Graham Bell's experiment in 1875. In 1876 Priest brought to England the first practical pair of telephones. In 1878 the Telephone Company was formed to sell instruments and instal private lines. In 1879 the first telephone exchange was opened. I think we can take the commercial beginning as the union of the rival companies in 1880 under the title of the United Telephone Company. This Company paid 6 per cent. in 1883, and we can surely put the industrial gestation period at a minimum.

In the case of incandescent electric lamps, Swann's first practical lamp was exhibited in 1878. It was not until 1880 that they were really on the market, or in 1882, when they began to be made in large numbers, and the Swann Electric and the Edison Electric formed in that year were amalgamated in 1883. The manufacture seems to have been a commercial success from the very beginning.

Sometimes the public are held back by an established prejudice in favour of an existing article with definite characteristics which is a good article in its way. For example, Sir Herbert Jackson reminded me of the case of the wire-bound brush, which was known to be a good brush and which held its own owing to public inertia against the

new and better form of metal-clamped holder. Again, he refers to a particular type of high-temperature glass tubing which had a certain cloudiness that was almost a certificate of its character, so much so, that a better product from which this defect was removed has been unable, over a long period of years, to establish itself.

In one instance of an ingenious mechanical device capable of use in a number of different directions—the lightning fastener for articles of wear and personal use, which did not, however, strictly supplant existing methods—the inventor spent ten years in improvements up to the time of patenting. After manufacture began in the country there were losses for three years, two years of small profits and then real expansion began. Throughout this period all the different uses were known and advertised, but only in the sixth year did the public seriously " catch on," and then they did so with great effect. The capital involved was not great, but it was in the hands of a powerful corporation with many other activities, and the period of industrial gestation was not only short, but never prolonged for financial reasons.

XII. The Effect of Invention on Economic Profit

I make the assumption that after a normal rate of return on capital, plus a special additional rate to cover the three elements, unusual industrial risk, deferment of yield, and wastage of the asset, and after a proper remuneration for the enterprise of the entrepreneur, no " normal " rate of profit exists. Economists will be thoroughly aware what is implicit in this assumption. A considerable part of the output of a given product at the ruling price will just suffice to cover these charges, some part will yield a minus or subnormal return, and others will give a surplus analogous to rent, a differential attaching to any special advantages of position or equipment or leadership. It is true that, taken arithmetically as a whole, these surpluses will yield an average, but it is an average without much meaning. As a matter of fact, every test I have known shows that when

these "super" returns are classified (by businesses) one derives a normal tail curve of distribution, the number of cases and amount of profit in each class of equal range (from a low yield to a high yield) being continually smaller. Now the average of a wide dispersion and of a narrow dispersion may be the same, *i.e.* £1,000,000 in the 1 per cent. class down to £100,000 in the 20 per cent. class may give the same MEAN result as £500,000 in the 2 per cent. class down to £200,000 in the 10 per cent. class, so that a notional average tells us little, and a coefficient of dispersion, or variation *about* the average, is necessary to complete the story. Competitors may appear to be much less similarly placed than they really are. The advantage of low rural wages may be offset by transport costs; local taxes by concentration of markets; old equipment with low handling costs by complete modern equipment. But despite the compensations of swings against roundabouts, in most trades the final or net differentials are important, and some businesses have the elements of great profitability. Does the introduction of an invention into an industry tend to increase differentials—that is, total economic profit—the more rapid its entry or the more striking it becomes? If the industry is one which requires heavy expenditure in fixed capital that is only slowly amortised, obviously scrapping can take place but very gradually, and if the invention is a "sudden" one, there will be much machinery of the old types which is almost new. If the invention has only a moderate degree of advantage, the period necessary for its domination will be rather lengthy, for that degree will not cover large obsolescence costs, and it will only just permeate through the renewal programme. But if the demand for the product is an expanding one, capital will be forthcoming for new factories fully equipped with the new device, and this will constitute a big differential compared with the existing supply. If the new invention has a much larger degree of advantage, sufficient to pay the obsolescence costs of a large part of the older machinery, the oldest factories may take the plunge, as well as the new factories which also arise. In this case the range of differentials will

be closed up. In the example of an entirely limited market, or a commodity the demand for which is very elastic, the newcomer has to reckon upon cutting out some of the existing suppliers. To do this, prices are cut, and so is the differential profit, but some of the old suppliers are driven below the normal line, where, without actual financial losses, they live for many years, yielding a financial profit which is not an economic profit, *i.e.* a return upon capital much below the postulated normal return on capital. Such businesses are in no good situation for raising new capital to re-equip themselves, and they tend to pass out altogether.

Thus there can be no simple answer to the question put as to whether invention increases economic profit. On the whole, modern businesses make more systematic provision for depreciation, and obsolescence, and probably renewal is not financially so difficult, so that they are ready to re-equip on the latest lines much earlier than they were. Probably, however, the initial increment of improvement in production by an invention generally is not so great, and its development is gradual but continuous. On the whole I incline to the view that the periods of rapid and important invention tend to be periods of larger differential profits. On the whole, again, therefore, the division of the whole product tends to be a fraction more in favour of capital as against labour—though with the cheapening of products this tendency is rapidly washed out in higher real wages, though they may be identical as money wages.

Dr. Dalton says inventions must be complementary to all factors of production taken together, though rival to particular factors taken separately—to labour, or capital, or land. He concludes that " Labour-saving inventions have been more numerous and important in the past than capital-saving inventions." But it is exceedingly difficult in practice to distinguish them, and certainly a distinction between those inventions which " complicate " and those which " simplify " machinery does not greatly help, for the more complicated machine (or the simplified one) so frequently does something more or different. A labour-saving invention is defined as " one that reduces the proportion of

wages to selling price per cent. in the industry." But the absolute share of labour in that industry may be greater, all the same, and when the other industries indirectly affected are taken into account, the final effort is indeterminate, except that the cheaper unit product is fair evidence of an improved real wage all round. An example given of a "capital-saving" invention is a new device for handling a denser traffic on existing railway lines, which obviates duplicating the lines, but even here the effect is not clear cut, and seems to turn on the avoidance of additional labour rather than the substitution of capital for existing labour.

XIII. The Economic Genesis of the Inventor

In that field of invention which does not depend upon any new discovery of the properties of matter, but rather upon a new mechanical combination and arrangement of what is already known, what is the most fruitful soil? How, from the economic side, is invention best induced? Does it really arise most from those who, working with processes and machinery, look for short cuts and neat ways, and whose very familiarity with the details enables them to appreciate both what is most wanted or necessary, and how to reach it? Adam Smith gave as one of the advantages of the division of labour that specialisation upon a particular job would give rise to invention of this order. He thought that concentration on a particular task led to "easier and readier methods," and the most casual reader has got as far in the "Wealth of Nations" as the boy who was able to go to his play because he joined the handle of a valve to another part of the machine by a string. But Adam Smith recognised also the part played by manufacturing specialists and "philosophers or men of speculation whose trade is not to do anything, but to observe everything." But even the philosophers had to specialise by subdivision of labour. We all know the unusual type of mind that is required to analyse the familiar, and how quickly use and wont may blunt the sensibilities. Perhaps the well-equipped outsider may see most of the game and can detect the

possibility of improvement and change. The experts of the Institute of Industrial Psychology have seen, immediately, points that have escaped reasonably good management entirely. Besides, division of labour or specialisation has often been carried so far that for the more comprehensive invention a really wider scope is necessary. To-day, general mechanical engineering does as much for the different industries as their own experts. "The technique of some of the textile and other industrial groups owes as much to the invention and initiative of mechanical engineers as to their own. The attention of the progressive engineer is concentrated on some branch of production which has been neglected, or of which the methods appear to be needlessly cumbrous." [1] He applies, with suitable modification, the methods and approach of other industries until he finds his way. Invention to-day springs far more from generalisation than from particularism in experience. There is still no economic career as an "inventor," with a starting curriculum, an entrance exam., a conventional reward which, high or low, regulates the flow of aspirants in competition with other walks of life. He is still *sui generis*, and emerges from the ranks of engineers, physicists and chemists, not indeed as a "sport," but as a special product, which is touched by no "economic spring." The sense of curiosity and the idea of fame play a greater part than the economic reward. Nevertheless, of all the increments in progress taken in the mass, a far greater proportion to-day than heretofore are made by formulated teamwork, precise record and elimination, resting on a purely economic foundation and acting in an economic framework—the research "budget" of a combine, or the collective contribution of a group of members of an association, administered by a high-grade scientist who has a "market value" like the salary of a Professor or an administrator. This is an economic development of the times, but the poor and struggling inventor beyond the economic pale is doubtless still responsible for much.

Jeremy Bentham, in the work already quoted, in a passage

[1] Marshall, "Industry and Trade," p. 206.

of remarkable psychological insight that appears to have been forgotten, remarks:

"The talent required for operating upon matter, or directing the powers of nature, is extremely different from that required for operating upon the mind—the talent of meditating in a study, and thereby making discoveries, from that requisite for making known those discoveries to the world. The chance of success in the career of invention is in proportion to the talent of the individual; the chance of obtaining a loan of capital from another to make an invention productive is in proportion to his reputation. But this latter, far from being in direct, is naturally in inverse proportion with the former."

In another place he deals graphically with what must surely have been some actual instance that had come before him.

"Not to speak of the obstacles which oppose the progress of an inventor incumbered with his projects and his wants, before he reaches the ante-chamber of the rich, or the noble, whom it may be necessary to persuade—suppose these obstacles overcome, and that he is admitted to their presence; how will the poor inventor, the necessitous man of genius, behave when he has arrived there? Oftentimes he will lose his presence of mind, forget what he was about to say, stammer out some unconnected propositions; and finding himself despised, indignant that his merit should be thus treated, he will retire, resolving never again to expose himself to such an advantage. And even when he is not devoid of courage, there is nothing more different, though in certain points the connection may appear most intimate, than the talent of conceiving new ideas of certain kinds, and the talent of developing these same ideas. Altogether occupied with the idea itself, the inventor is most frequently incapable of directing his attention to all the accessories which must be re-united before his invention can be understood and approved: his attention being entirely occupied with what is passing in his own mind, he is incapable of attending to what passes in the minds of others—incapable of arranging and directing his operations, so that he may make the most favourable impression upon them.

"Thus the ingenious philosopher, who has delivered the most excellent instructions respecting the art of developing the thoughts of others, and who possessed in so perfect a degree the talent of developing his own, well knew how necessary it was, that in every career of invention except that of eloquence, minds should be attended by an accoucheur."

And again, later, on the disabilities under which a poor inventor suffers, he says :

" The essential is not merit, but the gift of persuasion; this gift most naturally belongs to the superficial man, who knows the world, half enthusiast and half rogue; and not to the studious and laborious individual, who is only acquainted with the abstract subjects of his studies."

XIV. Economic Reactions on the Scientific Stage

Although so far I have kept clear of the pre-industrial stage of invention, as a period which is not immediately affecting the economic life of the community, I cannot keep clear of it when I consider the effect which the economic activity of the community may have upon that pre-industrial stage. If the economic community goes beyond the point of saying, " When the inventor comes to our door with his discovery we will welcome him, feed him, push on his invention by all the means in our power," and says, further, " We will go out and find the inventor and help him during his scientific endeavours to make the material side of his scientific labour as easy as possible," then the economic activity finds a wide expansion. Obviously every day by which the invention period is shortened, while it may not actually shorten the industrial period, starts the industrial period that much earlier. To-day, on a scale hitherto undreamt of, this is being done. A big combine, with its elaborate Research Department, puts everything into the scientist's hands—he does not hunt for funds; gives ready acceptance to his findings—he does not have to hawk round, proving to sceptics he is not a crank; supplies financial backing to the point of significant production in its works—he does not languish and die because funds are exhausted. The Research Associations cover part of this field in a similar way. All the same there is much waste and a vast deal to be done, if maximum economic advantage is to be secured.

First—Absence of Records

Sir James Henderson comments with much force upon the aggregate waste of human effort and capital in unsuccessful efforts at invention through the absence of records :

" Of the hundreds of inventions which have been abandoned as failures, or of possibly revolutionary inventions left incomplete simply from lack of capital or lack of courage, no record is available to those who come after and who might carry them on to success. Has every inventor for all time to start from scratch? The same difficulties crop up time after time in the development of inventions, yet every new inventor has to tackle the difficulties *de novo* and fortunes are wasted in the process. In most inventions there comes a time when the inevitable question arises ' Shall we cut our loss or risk further expenditure? ' If the decision is to cut the loss, the invention, which is probably a sound one and of great value, is pronounced to be a failure, and the result may be the loss of an industry to the country or a delay in its introduction for many years. Science will prevail in the long run, but the cost of the trials both in time and money could probably be greatly curtailed if records of similar ventures in the past were available. In every industry one finds that the experience thus gained in developing the inventions of the industry is guarded as a most valuable secret. The result is that this knowledge is not recorded and often dies with the individuals who possess it. Future workers even in the same industry have to pass through the same or similar experience to regain the lost knowledge, and the whole condition is economically unsound. The expense to the nation which it entails must be enormous. It retards progress, it adds greatly to the time and expense of developing other inventions, and it brings invention into disrepute because so many firms have lost money in trying to develop inventions which have had to be abandoned simply through inexperience."

This shows that if invention is to be regarded seriously as an economic factor, it would be worth while, from a purely financial point of view, to spend money freely in perpetuating records and facilitating reference to them.

Jeremy Bentham, in a vigorous criticism of Adam Smith's condemnation of " projectors " (*op. cit.*) says :

" The censure which condemns projectors falls upon every species of new industry. It is a general attack upon the improvement of the arts and sciences. Everything which is routine to-day was originally a project. Every manufacture, how old

soever it may be, was once new; and when new, it was the production of that mischievous and bold race who ought to be destroyed—the race of projectors! I know not what can be replied to this, unless it be said that the past projects have been useful, but that all future projects will not be so. Such an assertion would, however, require proof, strong in proportion to its opposition to general opinion. In every career, experience is considered as worth something. The warning to be derived from past failures may contribute to future security, if not to success.

"Were it even proved that no projector ever engaged in a new branch of industry without being ruined, it would not be proper to conclude that the spirit of invention and of projects ought to be discouraged. Each projector, in ruining himself, may have opened a new path by which others may have attained to wealth. So soon as a new die, more brilliant or more economical than the old ones, a new machine, or a new practice in agriculture—has been discovered, a thousand dyers, ten thousand mechanisms, a hundred thousand agriculturists, may reap the benefit: and then—though the original author of the invention has been ruined in the bringing of the discovery to perfection—as it represents the national wealth, of what consequence is this, when considered as the price of so much gain? . . . Truth possesses, however, this advantage over error of every kind: it will ultimately prevail, how frequent or how deplorable soever may have been the disgraces it has undergone. . . . As the world advances, the snares, the traps, the pitfalls, which inexperience has found in the path of inventive industry, will be filled up by the fortunes and the minds of those who have fallen into them and been ruined. In this, as in every other career, the ages gone by have been the forlorn hopes, which have received for those who follow them the blows of fortune. There is not one reason for hoping less well of future projects than of those which are passed; but here is one for hoping better."

Second—The Gap between Proof in the Laboratory and Proof in the Factory

Mr. J. W. Williamson, Secretary to the British Scientific Instruments Research Association, pointed out [1] that even in the case of researches of immediate application to industry the lag between the production of the result in the laboratories and its industrial application on a wide scale is "greater than it need be, and could probably be lessened

[1] Conference of Research Associations, 9th July, 1925.

by suitable organisation or systematic method." He distinguishes between two divisions of the period: First, the appreciation and assimilation of this significance by the industrial and technical staffs and, second, the application to every-day industrial practice, when appreciation has taken place. On the second stage he says:

> "In cases where existing methods or materials constitute a severe handicap in competitive production there will be naturally an eager readiness to try the new methods or materials, the outcome of the research. But where these circumstances are not present there is a less urgent need to scrap existing methods or materials, and a corresponding reluctance to be overcome before the results of research can be fully tried and developed.
>
> "It is clear that, if the industry is to derive full benefits from the results of researches successfully completed, and as to the value of which there is general agreement, it is not sufficient to circulate the results to members of the Association and to leave it to them to take all further steps to apply the results to the processes and products of manufacture."

It is clear that a large firm with its own research, having produced some new or improved material, would endeavour to stimulate and increase the use of the material by the consumers for whom it was primarily manufactured. "Having produced a good thing, the next business would be to create a demand, and a growing demand, for it. This would be done in the ordinary course of business by continuous and systematic advertisement, salesmanship, publicity and propaganda." But smaller members of Research Associations are less likely, especially if the new processes mean considerable temporary dislocation, to be tempted to launch out into large-scale production, and Mr. Williamson has suggested a bureau of information to act as a clearing-house between different Research Associations and also a development fund to encourage application and shorten the lag.

The annual value of the research put in hand by the British Electrical Research Association for cable-making was recently estimated at £1,100,000 to the industry—"this annual value will not be fully realised for some time, but it is estimated that at least one-third has already accrued."

The Launderers' Research Association recently reported savings to fifty laundries which have put in water-softening plants as £4000 per annum, but the saving to customers in the life of the garments is put at £100,000 annually, or twenty-five times as great.

Third—Dependence upon Prosperous Times for Progressive Policy

It is paradoxical that in depressed times, when industry most needs reorganisation, new methods and appliances, it is too nervous and too poor to try them. The United States in their recent prosperity could afford to try everything lavishly. Nothing succeeds like success, and to him that hath shall be given.

There is no reason why the actual scientific results of research should be different in bad times as against good (or with small units in co-operation as against large units acting separately). But the applied or industrial results may very well be. Thus Lord Balfour in his preface to the report, "Co-operative Industrial Research," issued by the Department of Industrial and Scientific Research says:

"The policy has now been in operation eight years, and has had its successes and its failures; though I cannot doubt that the successes have predominated. The experiment has been tried in difficult times. It is when trade is bad and foreign competition most severe that researches of the kind contemplated are most required; but it is precisely at times like these that a manufacturer is least able and least willing to undertake them. They are costly, they are uncertain, and even when successful their success may be slow. But though the difficulties are great, the need is greater still. The powerful and enlightened corporations of the United States and Germany are keenly alive to the necessity of turning to the best account the scientific discoveries for which this age is so remarkable. They believe in the policy of research; they carry it out with courage, enterprise and great resources; they take the long view, and they are richly rewarded."

XV. Human Capacity for Life in an Invented World

Economic progress in a large sense is, however, not merely determined by the development of the possibilities of the

physical world by man's ingenuity in discovery and manufacture. It depends also on man's own capacity to absorb and enjoy and master. I am not developing the moral side—that man may "gain the whole world and lose his own soul"—or the familiar argument that man's moral nature has not advanced *pari passu* with his mastery over nature. I am only suggesting that on the purely mental side, if productive life is becoming more complicated, a proper manipulation of it, to the full enjoyment, may demand a more complicated man too. Assuming, taken in the gross, that enjoyments are more numerous, and even more keen, and assuming they entail greater nervous strain and racket, is *net* enjoyment on balance greater? A question as to relative real happiness in all the ages! The human machine, so to speak, goes faster and further, but at greater cost in fuel and repairs. These calculations are not resolvable. They are ultimate and perhaps teleological. But though ultimate, they are relative. For prehistoric man, "vacant of our glorious gains," would have been exhausted and bewildered even by our simplest pleasures. Mechanical and scientific discovery, even in practical form, is not economic wealth until man has learnt to enjoy it in an economic sense. So I am not far from asserting that mechanical progress must be discounted by the lag in mental progress in the management of life before we determine some derivative measure which we call economic progress. Certainly our powers of reaction to new standards—for example, of speed—even in a generation, are remarkable, and every question of economic progress as an expression of net human enjoyment or "utility" is the quotient of total gross enjoyment divided by toil or "disutility" (including a quota of age wastage, if any).

We often talk of our much shorter office hours as compared with our grandfathers', as a mere difference in devotion to business, or attitude towards the ends of life. But, in fact, in seven hours to-day the average business leader, with the telephone and the stenographer and typist and statistical office methods and appliances, is probably making twice as many decisions and separate units of judgment as

his grandfather did with a twelve-hour day. He stands the racket and provides the mental fuel by more specific outdoor exercise and a more varied life. But the human reactions to the greater demands of an inventive age are generated by nature herself in haphazard fashion. So far we do not spend much conscious effort on human psychology, to make it meet, by increment of mental power and poise, each increment of complication and compression in social life. Conscious attention to the art of thought, and still more to the subjective art of living, is the correlative problem to inventive advance. Advance even in gustatory enjoyment is something more than the continually swifter swallowing of interminable oysters, be their quality never so progressive. It is on the human equation perhaps that the immense advance in America has caused a temporary lopsidedness, and although the American gets, as we say, " so much out of life," it is doubtful whether his economic advantage over the French or Italian is really measured by the monetary difference in their material standards of life.

IV

INDUSTRIAL CO-OPERATION

IV

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1. The Present Vogue

The fact that "industrial co-operation" is passing into a catchword has both advantages and perils. The advantages are that it does not immediately summon up a complex of suspicions against a stranger breaking into our set and accustomed ideas, and that it is no longer thought a dangerous fad. But the peril is that we may cease to examine it critically—may expect it to be too much of a panacea, and may even leave the word itself to do the work that we ought to be doing ourselves.

After showing the necessity for the movement I want to examine some of the second line of consequences or implications of industrial co-operation, *i.e.* to trace what happens in the results of it, as well as to give a practical account of the schemes with which I am familiar.

I do not wish to deal with any general questions of industrial peace, and methods for the avoidance of strikes—subjects that would lead me too far astray from the field selected. Granted these methods are discovered and available, what happens in between? Are the intervals of industrial peace to be a "truce between foes or a hearty co-operation between friends"?[2] What will be the difference in the productivity of industry under the two tempers? I would merely state that successful working out of the principles of solidarity in the interval ought to make the intervals longer, and the conflicts more human and less swayed by mutual ignorance and misunderstanding. Nor do I enter upon the great questions of wage fixing, adjustments according to varying prosperity, or the pros and

[1] Address to the Congress of the Institute of Transport, Liverpool. "Industrial Co-operation as an Economic Factor." May 18th, 1928.

[2] Newfang, "Harmony between Labour and Capital," p. 177.

cons of profit-sharing, though I acknowledge their importance as closely allied to successful co-operation.

At the original meeting of what has come to be known as the "Mond Conference" in January last, between the representative group of employers and the General Council of the Trade Union Congress, I had no right to speak compared with the many men present who had a lifelong experience of industrial problems and relationships as against my short service in industry, but I did claim that for nearly thirty years I had been studying from a particular angle the facts that make for national and industrial progress. That study has given me some definite ideas, which make me feel that this present year or, at any rate, this present era, is a critical time for our country's industrial history—critical because only the full emergence of a factor hitherto left in the background can really keep us in the front rank. It is critical because in a review of the factors which have made for prosperity in the past we can see that there is now a complete change in their relative values. Several years ago, I showed that the general standard of life for all classes of the community had, during the nineteenth century and up to the war, increased fourfold.[1] The increase had not been attained uniformly through the period: sometimes it went on rapidly, sometimes very slowly; sometimes we went ahead of other countries, sometimes we fell back. The variations were not merely accidental or pure chance; they depended upon real and often measurable causes, such as the development of transport, or invention, and the movement of the price level, so that one of the influences at work at any particular moment would react on the progress of the whole. To the Trade Union Congress I suggested that there were really four factors which are the determinants in the relative progress and the standard of life in the country.

2. The Four Factors in Economic Progress

First, there is the character of our people; secondly, there are our natural resources and the actual acquired advantages, measured against the size of the population; thirdly, there

[1] "Wealth and Taxable Capacity."

are capital accumulations of past and current savings, looked at both as to the amount and also the form they take. One country is not as rich as another because both have ten thousand million pounds "worth" of goods, if in one those goods are obsolete. Nor is machinery so valuable which does not represent the latest methods and processes. Fourthly, there is the human organisation or relationship in which these three factors work, the social conjuncture.

First, on balance the character of our people is undiminished in power and quality, and it need not be discussed further here. Second, we shot ahead of ourselves and ahead of the rest of the world, both in our natural resources and also in our industrial development, at the time of the industrial revolution, but as other countries developed industrially and attained to political unity, we lost that advantage, and, as I see, cannot regain it. So our preeminence in natural resources and their development is not what it was, and our wealth of this kind per head of our much greater population is not so conspicuous as it used to be compared with other nations.

Under the third head we have fallen back individually and collectively. Additions to the saved capital fund are at present only 70 per cent. of what they were when we enjoyed the old rates of progressive improvement, and it must be remembered that there is a great difference between savings out of income and real additions to capital resources. If a man builds a garage for £200 out of income, he has to reserve that sum out of his income and to deny himself that spending during the year, or literally *save* it, regardless of the fact that a £100 greenhouse has been burnt down during the year; but the net addition to effective capital is only £100.

Our annual sum reserved out of income has therefore to be debited with ancient and obsolete forms before we are able to determine the new and effective addition. That is why we must not be complacent, for the net national additions to resources are dangerously small at present, in spite of the alluring figures of the Stock Exchange and the Money Market. At the present time these net savings are not large enough either for home use or for the old scale of export,

which before the war took the form of investment of capital abroad. Moreover, the forms in which past savings are embodied are less up to date and fitted to the world about us.

Formerly we were so rich in those first three factors that we relied upon them and did not bother ourselves very much about the fourth. We could prosper almost while we ignored it or maltreated it. This fourth factor of human organisation and the scheme of relationships is now something which we must specialise on, since we can do so little to improve the others. We simply cannot afford to fall behind others in the application of pure research to industry—we want it on a new scale with a new spirit. We simply cannot afford to spend the time we used to do on trade disputes in the old style—we have not enough of the other advantages to stand it. Neither can we afford to ignore the scientific management of industry.

When navigating awkward waters and under the stress of rapid currents we cannot be fighting, or larking, or rocking the boat, for we must meet with disaster, although in smooth and open water no harm might come to us. To-day we cannot just trust to luck to come out right. We have a number of intricate problems to study and work out : the financial adjustments of industry and the supply of credit and capital, the adjustment of costs to output, the fine margins of foreign trade, the incidence of taxation, the direction of new capital supplies and the adjustment of old ones—all quite unsolvable except in an environment of co-operation and calm and intense earnestness to tune up our joint effort to its highest pitch. All these things require the fourth factor of right human relationships in industrial organisation for them to be worked out to definite results.

We have now to bring into play that fourth factor, and to give it its full value in our national life.

The real National Income in goods and services over a whole recent decade has hardly changed in spite of our large increases in population, and in spite of the very great additions to our capital resources applied to industry.[1]

[1] *Vide* " The National Income," 1924, Professor Bowley and Sir Josiah Stamp.

The recent report of the Committee on Industry and Trade in their fourth volume remarks, upon the Census of Production figures, that as between 1907 and 1924 the real increase, apart from prices, in the net output per head was relatively slight, despite the improved means of production, changes in business organisation, technical processes, plant and machinery, which have been largely offset by other factors, *e.g.* the reduction of working hours and the depressed state of employment. Compared with 1907 the mechanical power at the service of industry in 1924 showed a much greater increase than the per capita increase of production. The Committee conclude, moreover, that after making full allowance for special considerations, the wide discrepancy between the rates of increase of horse-power and productivity per head of the working population contrasts unfavourably with the corresponding figures for the United States. An estimate based on official figures [1] indicates that in the United States between 1904 and 1925 the rates of increase of net industrial production and horse-power per head of employees were almost identical, *i.e.*, about 64 per cent. Such differences naturally suggest the question whether in Great Britain full advantage has been taken of the increased power available, and whether some other factor may not have been simultaneously operating to limit the per capita production of industry, or to keep the costs of production above the level at which the full output can be disposed of on economic terms. Such a stationary state of affairs has not been true of previous decades during the nineteenth century. The present time is a turning point, and that is why I give such importance to this fourth factor as one on which we have to relay to an extent hitherto unnecessary.

3. What the Idea of Industrial Co-operation Includes

People fill up the content of this fourth factor, which we call "industrial co-operation," in various ways. They

[1] Statistical Abstract of the United States, 1926 (figures for output corrected for changes in wholesale prices).

may include the same sub-divisions, but they place greatly different stress upon them. First of all, we have the identification of every member of a concern with the interests of that concern, *i.e.* a worker, instead of regarding it as a job which gives him a wage—the most that he can squeeze out of it for work the least that he can give, or, putting it on a higher plane, which gives him a fair day's pay for a fair day's work—really becomes keen on the success of the concern and works for it as well as in it.

Under the second head are economies of working, in which, by having a sense of personal interest, he feels bound to save expense in damage to tools and equipment.

Under the third head he puts into the common stock any ideas that he may get for improvements. In other words, he minds other people's business as well as his own, and has a further interest in the concern than merely doing as he is told.

Under the next group he is to be given an interest, so far as his position and capacity allow, in management and success, where the character of the industry permits. Then, lastly, all parties are encouraged to come together for the solution of large overhead problems involving national and international conditions subject to which his concern operates.

For example, he is told that the success of business life and the magnitude of his own share of it are largely conditioned by underlying and overwhelming forces—great problems that require larger knowledge and new wisdom to solve. He is to be asked to join in a consideration of them, and to express his views. It may be new ground to him; he may feel at first that it is not his business, but it is essential that he should be made aware of the extraordinarily strong conditioning forces that are at work, like a tide which carries his concern—the ship on which he works—whither it will.

Such questions are being discussed in the Mond Conference as the view that the business man should take of the problem of finance, the supply of credit, the resiliency of the gold standard, the position of the price level in its international reactions. Again, what does the worker think of the

problem of the sheltered and unsheltered industries and the rectification of the anomalies between them? These are vital to regaining a position of stability. What is his attitude towards the protection, not so much of a business, but of a particular labour market, by tariffs, and his attitude towards the tariffs of others, not as a political issue, but as an issue directly affecting the conduct of the business in which he works? Can he bring into the common council of the management of his business a contribution of value and insight?

4. The Lessons of Past Experience

Merely to survey the field of past attempts at co-operation in one's own country, in order to make generalisations, is to run the risk of being drawn away by individual and personal considerations governing success and failure in particular cases. I look, therefore, over the field of American experiment, which on the whole has been more advanced than our own, and where a great deal of review and summarisation has taken place. Austin and Lloyd say, "In the matter of the relations between employers and workers America is undoubtedly many years ahead of us." [1] What are broadly the lessons I learn from what is known there as "industrial democracy"? First of all, it has no necessary connection with mass production, for some of the most successful mass-production plants have been autocratically governed. I trace considerable reactions since the war. One shrewd American commentator says: "During and immediately following the war we became quite evangelistic about industrial democracy, and many business men rushed pell-mell into artificially conceived schemes of democratic business organisation. We tried to hasten industrial democracy by hot-house forcing methods. We tried to create overnight and by executive order what can only be achieved by the slower processes of growth." As a matter of fact, mistakes in this particular field have to be paid for as we go along, and cannot be covered in the same way as mistakes in political democracy. Much of the enthusiasm

[1] "Secret of High Wages," p. 108.

has waned, and there is a reaction set in because so many schemes can only keep their workpeople in a good humour so long as production is at its highest point. The political scientist says that the problem of politics in the United States has been hitherto the *quantitative* extension of democracy, whereas in the future it is its *qualitative* development; and in this country, now that we have extended the vote to everybody, we can devote ourselves to consideration of educating them to use it; it is no longer " Are you going to get it? " but " What are you going to do with it? "

The first thing appearing from American experience is that the mere theory that it is right to give every worker, however humble, a voice in the building that he is helping to build, without counting the practical considerations that emerge, is doomed to failure. Mr. Filene says : " I have seen the mass of workmen in a fairly democratised business insist upon going back and making all the mistakes that their leaders had made when they were younger and on the make. I have seen the workmen and many of the executives in such a business stop their leaders when they were just on the point of realising rapid results that would have been to the benefit of every man and woman in the business." He remarks again that " mere playing with democracy, in the sense of throwing a temporary sop to discontented workmen, is really unworthy of sound business leadership. Industrial democracy is either a sound principle of business organisation that will put industry on a firmer foundation, or it is a species of compromise with unrest that is dangerous to the future of business." The truth is that the successful limits of democratisation of a business vary with the class of business, the nature of its management, and it may mean anything and everything, from " benevolent paternalism on the part of the employers to sweeping usurpation on the part of the employees." It is not enough to say that the employees should have an adequate voice in the " determination and control of the conditions of work," for an adequate voice means quite different things at given stages in a given industry. What is wanted, of course, is a process of education. But this is not education merely of the worker, it is also the

education of the lower executive officer who has to realise that good ideas may come from the humblest worker, and are more likely to come if encouraged, under judicious control, and with practice. He has to learn also that " man dressed in a little brief authority " does things " that make the angels weep." We have to encourage a vast quantity of latent ideas, full of gross misunderstandings, full of ignorances, and to distil from this turbid liquor the clear essence of collective wisdom. Above all, the lower executive is the man who has to stand the racket when ideas put forward by those whom he has to keep under discipline seem to be a criticism of his own past management and efficiency. It demands a great deal of grace and good humour on his part, that are more difficult to cultivate even than fresh-mindedness and new knowledge. Those of us who have " bright ideas " have learnt that we are lucky if one in five turns out to be *really* bright. It is better that the worker should learn this salutary lesson by experience rather than from mere *ipse dixits* from his officers. We cannot complain if workmen, as a mass, have not actually on the surface a large degree of managerial ability, because evolution of business has not so far made it necessary to evoke it.

" We simply do not know how much latent business ability is locked up in our employees; we do not know what interest in the business, what sense of responsibility, and what managerial ability they would display under a form of organisation that limited the present secret diplomacy of business and afforded to employees a freer access to the counsels and control of industry. It is unbusinesslike and unscientific for us to content ourselves with mere theorising about what employees want." [1]

The real obstacle to successful democratisation can perhaps be summarised on the one hand as the ignorance of employees, and on the other as the ignorance of employers. But by a man's ignorance I do not mean so much that he does not know, as I do the worst kind of ignorance—that he does not know that he does not know !

Mr. Filene gives the following practical steps so that

[1] Filene, " The Way Out."

American industry may wisely and safely be adjusted to the oncoming democracy :

" First, business men must be really convinced that it is really inevitable.

" Second, they must satisfy themselves that success and adequate profit will not only not be interfered with, but will be greatly helped by a business democracy that removes from the workers the feeling that they are shut out from the inner councils of business where the decisions that determine their lives are made.

" Third, that big business success in the near future will be made only by men conducting their business from the standpoint of the service of the consumer.

" Fourth, business men must, for the time being, be as autocratic as necessary and as democratic as possible. Even benevolent feudalism, unsound as a permanent basis for policy, may be necessary and important at this stage in industrial development.

" Fifth, business men must begin at once to experiment with the methods and machinery of business democracy, going as far as possible without interfering with thoroughly successful operation. For it is not in business true, as in politics, that self-government, although inefficient, is better than good governing by others.

" Sixth, business men who have taken the five preceding steps and become rich enough for greater risks, should turn their free time and money into their business rather than into outside charity, philanthropic or public activities. The hope of industrial democracy lies in the great employers who will know how to mix courage and caution in their experiments in the next decade."

Mr. Filene puts great stress upon the education of executives and sub-executives in democratic business.

5. A Concrete Scheme in Practice

If I place so much stress upon the fact that co-operation cannot be applied to all industries as a cut-and-dried scheme, but that each must work out its own problems, leaving Mond Conferences and such general movements to create a desire and an atmosphere and deal with the larger general problems, I ought at least to give some details of a concrete experiment within one industry and one concern in that industry before I again generalise upon the economic aspects.

So I will outline the steps taken on the London Midland and Scottish Railway to give actual expression to it.

This scheme is designed to secure, as a permanent part of the railway organisation, the continuous co-operation of the entire staff in the many and diverse ways open to them.

To implant the idea of co-operation definitely in the minds of all concerned in the industry, and to stimulate practical expression of that idea, it seems necessary :

(*a*) To emphasise the present need for combination of effort, and its potential mutual value.

(*b*) To awaken in each man a sense of responsibility for a personal contribution to the success of the business.

(*c*) To appeal to the best instincts in men for something that great amalgamations and the changes they entail may possibly not evoke, viz. pride of craft, dignity of calling, capacity to help with head and hands.

(*d*) To devise means by which a new outlook may be fostered, and definitely expressed in action.

(*e*) To declare frankly that the arrest of a decline in the fortunes of a business must benefit all parties by resulting prosperity and maintained employment.

Co-operation, in its highest expression, must be something more than an urging of the workmen to greater effort at their daily task, in the hope, or with the assurance, that additions to wages on the basis of increased output will accrue. That system tends to induce a " short-period " mercenary attitude of mind. It may secure a greater expenditure of physical or mechanical energy, but it takes little account of the potential values of dormant mental faculty and goodwill. True co-operation should aim at harnessing brains, as well as muscles, and so secure the maximum of effort of men and officers in dealing with the problems that arise from day to day. By such action men gain a more elevated conception of the dignity of their calling, and of what is required from them; and, as invariably happens in all spheres of human activity, a sense of increased responsibility leads to develop-

ment of capacity, and such increased capacity will naturally be applied to the performance of their daily tasks.

It is a commonplace to say that any real scheme of co-operation must be founded on mutual goodwill. Ample opportunity must be given to all concerned in the business for free and full expression of their views; there must be a willingness on each side to receive such expressions sympathetically; and there must be a mutual readiness to profit by any criticisms or suggestions offered.

The modern working man does not respond freely to lectures addressed to him by his employers, either orally or by circular, and too much emphasis cannot be given to the necessity for any appeal for assistance being accompanied by the provision of means for enabling men to show their response in some definite and practical form. Without such opportunities, appeals, however eloquent and forcefully phrased, may fall on deaf ears, or be received with positive antagonism. On the other hand, if facilities for consultation and action are afforded, may not the minds of the men begin to work, and soon seek a form of expression in deeds?

For the purpose of introducing co-operation, a great initial advantage is gained if there exists in the particular industry any form of recognised machinery for the discussion of matters of common interest between the management and the staff. In this respect the railways of Great Britain enjoy a unique position. Since 1907 there have been in existence schemes under which elected representatives of the men can meet the officers for discussions of matters of mutual concern. Conferences are held between headquarters' officials and spokesmen for groups of grades relative to questions affecting those grades throughout the railway. Minor conferences also take place at all important centres between local officials and representatives of the men to deal with matters domestic to each particular locality.

The L.M.S. Railway Company accordingly decided that they would make the fullest use of the existing machinery, and would so widen its functions as to admit of discussions by the several Committees of practically all subjects affecting the Company's business. The general principles of the

Company's co-operation experiment were expounded at a series of meetings held in twenty-two different areas, attended by headquarters and local officers of the Company, including those in regular direct contact with the staff, and representatives of all ranks appointed by the men. The total number of persons attending those meetings ranged from 106 to 400.

These combined conferences were preceded by two separate preparatory meetings : one, of the Company's officers, who were urged to play their part, in spirit as well as letter; and another of the men's representatives, to whom the project was explained, and commended, by their leaders.

The Company also invited to the Conferences about 900 employees who occupy seats on magisterial benches, Members of Town Councils, Boards of Guardians or other Public Authorities, Co-operative Society Committee members, etc. etc.

At the joint conferences, officers of the Company submitted to the men full and frank statements as to :

(1) The unsatisfactory position of the Company's traffic receipts.

(2) The disappointing dividend returns in recent years.

(3) The depleted condition of the Reserve Fund.

(4) The serious depreciation in values of the Company's stocks, etc.

(5) The heavy annual cost to the Company of compensation for such things as goods lost and damaged, rolling-stock damages, accidents to staff, etc.

Some of the causes of these unsatisfactory features were explained; and in appealing to the men to assist in retrieving these misfortunes, in maintaining employment, and their existing good conditions of service, a number of methods by which they might give their aid were explained. They were urged :

(*a*) To use their influence in support of proposals designed to further the Company's interests as publicly prosecuted.

(*b*) To use their influence with the religious, social, political or other associations, and with their friends, in securing additional business.

(*c*) To study the requirements of the Company's customers, and promptly respond to them; to exhibit courtesy and attention generally.

(*d*) To exercise care in handling goods;

(*e*) To practise economy in the use of time, stores, lighting, heating, etc.

(*f*) To safeguard the valuable tools and machinery supplied for carrying out their daily work.

(*g*) To observe carefully the "Safety First" slogan, with a view of avoiding personal accidents and needless waste of money on compensation.

At each of these initiatory conferences there were frank discussions and all shades of thought were expressed. The men freely criticised the management; they exposed defects and slackness in the organisation; they cited results of lack of co-ordination between different departments. In this way the mind of men who are concerned with, and are intelligently watching, day to day operations, was ascertained, and if this friendly counsel is rightly used, the stock of common good must be increased.

The Company's workshop employees are being brought within the range of the movement, but the position with regard to them presents some difficulty. It took some time before complete machinery for bringing the officers of the Company, and elected representatives of the shopmen, into general consultation was settled with the numerous Trade Unions. Further, their conditions of employment differ in many respects from those of other classes of railwaymen: they have not the same degree of permanence or continuity of work; in the shops there are more frequent dismissals, both of individuals and of groups for whom no work is available.

Another material factor affecting the minds of the shopmen is that it sometimes happens that, concurrently with a reduction in the number of staff, the Company finds it necessary, for good reasons of policy, to place with private

contractors orders for work for which the men think they might be retained.

These circumstances might have been thought to foster in the minds of the men suspicion and prejudice against the management, and result in a pronounced hesitancy to accept the scheme. Happily, however, there was no ground for these apprehensions. The various grievances were fully aired and frankly discussed at each conference, the Company's proposals were well received, and a series of Resolutions promising active co-operation was passed unanimously (*vide* Appendix to this Chapter) both at the conferences of the shopmen and of the operating staff.

The launching was thus successful and the reception by the staff enthusiastic. One is justified in feeling that it must, sooner or later, yield good results, and interest naturally centres on any available information as to the nature and extent of those results.

It is obviously too early to set down in tables any concrete figures as to advantages gained. There are indications of definite betterment in certain directions, but it would be premature to attempt to measure permanent benefits from these indications. Standing out amongst the uncertainties, there are several positive things that may safely be said.

The staff are developing a new outlook on the problems of railway business, and a new method of approach to them. They are realising that they cannot continue to " get out " of the industry their present benefits unless they " put in " of their best, and there is a growing appreciation of the duality of interest in the concern. It is an example of Mr. Philip Snowden's declaration :

> " The condition of industry is such that it is imperative that we should get employers and workmen together, that they should abandon their old ideas, that they should realise that they are all partners in industry, and that they should pool their brains and pool their energies."

There has been brought into existence a new spirit of mutual confidence and helpfulness between officers and employees, and a determination to work, in old and new ways,

in the interests of the Company. A proof of this may be seen in the interest in the Railway Company's Road Motor Bill. Their influence was a material factor in securing a second reading majority of 357. A quite new feature is that numerous communications have been received from interested men seeking information and guidance as to their action on the subject.

Many railwaymen are actively engaged in successfully canvassing for business.

There is a closer " working " alliance between supervisors and supervised. All over the line men are exhorting their fellows to give greater output, and to fight against all forms of waste and extravagance.

During the first three months of 1928 there have been over 500 meetings of Local Committees at important stations for discussing local business matters, and that number is five times greater than in the corresponding months of 1927. The significance of this is that the fewer meetings in the earlier year were held, generally, to consider grievances of the men, whilst later the greater number of the meetings were mainly concerned with the subject of co-operation and the methods by which it can be made effective. It is encouraging to know that at these local conferences the men themselves have pointed out numerous ways in which the business may be more efficiently conducted.

6. Economic Aspects of such Contributions

Having looked at a concrete scheme, now let us generalise about the economic results of all such efforts in industry.

It is as well to remind ourselves in the first place as to what can be regarded as economic betterment. The economic aim is the maximum production of goods with the least cost or effort, but that cannot stop short at mere production, for the maximum is not worth much unless it is brought to the right places, where it can give maximum satisfactions. Again, it must be divisible on the most equitable and advantageous lines, and " equity " does not mean merely people's desires, but their reaction to their

opportunities and their service to the production; and "advantage" means that such a reward is going in such a way to the different factors as will maintain a flow of their services to the common good at its maximum point. In other words, it is no good in the long run having a system of distribution in obedience to some ideas of equity or fairness if it acts so as to destroy or materially lessen the aggregate to be divided.

The vice of all discussion on distribution in the past has been the tendency to focus upon the mere *proportion* of the aggregate, instead of on the aggregate itself and the dynamic tendency of the aggregate.

How characteristic is the following:

"Under the present system of industrial relations there is an irreconcilable antagonism between labour and capital, for the reason that, whatever is taken from the proceeds of industry by the one must necessarily reduce by that amount what the other can receive."[1]

This merely copies the old fallacy of the "Wages Fund," and every employer has to realise to-day that the dynamic effect on production of a higher proportion for wages may be a larger absolute balance for himself, and every employee that anything taken from the competitive rate of interest for saving and risk is "slow suicide" for the whole organism. It is better to have 35 per cent. of 120 than 40 per cent. of 100.

7. Is Quick Transport an Economic "Value"?

In my recital it will be seen that transport plays an important part, and speed is of the essence of economic satisfaction. It is of interest to examine why this should be so, and whether there is a limit to the price that can properly be paid for it. In the first place, it enables the distribution of perishable articles, including newspapers, to be much wider, and thus to maximise the value of the flow from a centre. In the second, if the time between production and consumption is shortened, less circulating capital is taken

[1] Newfang, "Harmony between Labour and Capital."

up in maintaining the flow of goods. For example, if the time of transit of coal from pit to cellar were halved, the capital involved would be greatly reduced. But it is not much reduced if the time saved in transit is merely added to storage. Nor is there any saving of capital in bringing more quickly a cargo of Brazil nuts—*i.e.* a crop which has a fixed time between production and average consumption. Speed, however, gives its capital saving in the concentrated use of the assets employed—the trucks, the ships, etc.—which may be made to do double the work, and, of course, the attendant working expenses of those who look after them. But there is a point of rapidity which gives a fictitious economic value, not compensated by its economic cost. Thus a man used to go into a multiple shop for a certain kind of boot and was told they had just sold the last pair, but some more would be in stock from Leicester in three days. This is improved on now by "the day after to-morrow" or perhaps "we shall get them by to-morrow morning." Some day it may be "in three hours." But is this acceleration such an extraordinary economic boon, after all? Might not the extra trouble, organisation and capital necessary to bring it about be better invested?

Up to a certain point the quick satisfaction of our wants is a real addition to economic value, but beyond that point the mere pandering to a fad of instantaneous satisfaction can easily become a boon too expensive at its cost. This is an age in which we are learning the immense economic gains of dealing with commodities in the mass, and not in excessive detail, and yet, at the same time, upon railways we are experiencing an economic revolution in the opposite direction. The number of consignments of handled traffic per ton appears to be approximately three times what it was before the war. The general explanation is that, owing to the changes in the price level and its more rapid fluctuation, the retailer and small dealer will no longer keep a considerable stock, for his capital will not run to it, nor is he prepared to suffer the risks of fluctuation in price; he throws these back upon the merchant and producer. He therefore orders little and often, and expects, or depends upon, immediate delivery,

whereas formerly his stock tided him over for several days. It may well be that the price of the final article per unit, in consequence of this change, must be higher if the handling in small quantities enters into cost. One has only to pursue it in degree to minute quantities ordered every two or three hours to reduce it to the ridiculous. There must be a point at which the curves of convenience and cost cross each other. What I am doing is not so much to deny that celerity of satisfaction is, in many cases, an economic boon, but to ask whether it may not be a boon too dearly bought. Of its psychological and personal reactions I will say little. Many of us to-day are like children crying not merely for the moon, but for the moon *at once*, and I am doubtful whether all the time saved in getting our wishes satisfied immediately is altogether good for human character. Often saving of time is not wholly an economic boon. It was a significant story narrated in the *Spectator* recently of a typical New Yorker with a Japanese friend travelling on the sub-way, who seized his visitor at a particular station and dashed across the platform into another train. "Why was that?" asked the astonished foreigner. "Wasn't that train going to our station?" "Oh yes," said the New Yorker, "but this one is an express, and we shall save a minute and a half." "Oh," said the Japanese blandly, "and what shall we do with the minute and a half when we have saved it?"

8. The Economic Effect of Getting Increased Business

Can it be said that the group of activities classified as "getting business" or "influencing custom" has any final beneficial effect upon economic society as a whole, as distinct from individuals? Suppose the railwaymen of a particular line are very active in suggestions for obtaining business, or influencing its direction, and they thereby improve the financial position of their concern. Have they not merely diverted it from a neighbouring line, where workers are not so active, or, if their compatriots on the other line are equally active, and balance their efforts, have they not pos-

sibly both exerted a great deal of energy for nothing? Or have they, at best, prevented it from diversion to the road interests? Is there any net improvement in aggregate net output, or satisfaction, or is it a mere reshuffle of what exists already? In my view, inasmuch as under modern conditions it is one thing to *attract* traffic, and another to *keep* it, no body of men can stop short at merely begging for trade—they must realise that service has to be given to justify and to retain, and to the pride of winning they must necessarily add the responsibility of being worthy of their gains. Men cannot stop short at being keen on getting customers; they will extend their sentiment into a pride in the concern and solicitude for its successful organisation. Such an attitude is a preliminary to all other *esprit de corps*, and to individual responsibility and team work. No man can be slack about the custom without the same spirit spreading through his work, individual and co-operative. So the personal touch in getting business has virtues beyond itself, provided an undue amount of energy is not put into such rivalry at the expense of the task itself. Even if the sides balance each other in their efforts, probably the " net product " is more neatly and economically reached over all. The psychological value of an outlet for pride and rivalry is in its zest and sportsmanship, making life keener and more interesting.

The desire to " get business " is obviously the outpost to personal efficiency and reliability, and yields economic increments alike in kind though different in degree from economies and service.

" The attempts to secure industrial harmony by purely mechanical device must always fail. The judgment behind finance is nourished by discipline, restraint and vision. These are its moral sanction: ' where the treasure is there will the heart be also.' In daily use this means that in business cash by itself is nothing. It is only a counter for the service of the mind which is endowed with creative gift. You cannot make a successful company of prodigal sons. Their extravagance is not the hindrance; it is the absence in them of the necessary vision and the mind equal to the effort and sacrifice of creation." [1]

[1] James Kidd, " Unity in Industry," p. 140.

9. Economies in Materials—Ultimate Effects

When by care or forethought an economy is made in fuel or other auxiliary agent of production, the effect is as though the existing machinery or plant had been made more efficient or an improved machine had been introduced, with, however, this important distinction, that no capital expenditure is involved, which has first to be remunerated and a surplus produced, before the advantages of the innovation are felt. The bearing of this is that the financial results are not as *differential* as they are in the case of new machinery, between the concerns that can afford to introduce it and those that cannot, or the concerns whose machinery is due for renewal and those whose machinery is not. Now changes of this order obviously can find their final economic destination in one of three places according to circumstances :

(*a*) In the reduced price of the product or its improved quality.
(*b*) In increased profits to capital.
(*c*) In improved wages or reduced work time.

The psychology of the worker doubtless may often be : " Suppose I do co-operate, and by ingenuity and care make a certain saving, where do I come in? Am I not merely improving the position of the capitalist? Why should I bother? "

The actual fate of any given unit of economy in its final economic effect will depend upon :

(1) Whether it is particular to a certain concern, or general to an industry.
(2) Whether the demands for the products of the industry are elastic or inelastic.
(3) Whether the industry is sub-normal in its results as regards profit on capital, and struggling to maintain a position against competing industries, *e.g.*, Railways as against Road Transport.
(4) Whether a supply of new capital for improve-

ments is, or is not, an important factor in maintaining the size of the industry.

(5) Its competitive power and therefore its ability to keep employed a given number of workers.

I will deal with some of these variants, and in order to save time and space must, to some extent, use economic terminology.

First, as to generality of the improvement. If the change in cost or efficiency is general, it will be a reduction of cost at the margin, and thus enter into cost of production and lower the price of the product. It would not be a differential, and therefore cannot enter into economic profit as such. Now if it lowers the price of a product, then, according to the degree of elasticity, a larger quantity of the commodity or service will be taken—with great elasticity, perhaps so much larger as to bring in a larger net revenue. But even whether the net revenue be larger or smaller, the output will be increased and employment in that industry will be larger. Whether the unit of wage will be higher or not depends upon many differing factors. If, however, demand is inelastic and the change in price does not greatly affect the amount taken off, the purchasing power in the hands of customers is economised and diverted to other channels, increasing employment elsewhere. In either case the lower cost of service becomes a part of the general cost of living. Suppose that the workers in industry (*a*) with a certain wage, made themselves none of the gains of co-operation of which I am speaking, but such gains were made in industries (*b*), (*c*), (*d*), (*e*) and (*f*), then the real wage for the workers in industry (*a*) would be greater by its improved purchasing power, and perhaps new industries would be stimulated by the released purchasing power in the hands of all the workers in (*a*) to (*f*) inclusive. Now let us suppose that the gains of co-operation are not, in fact, general. Then there will be a marginal supply with unaltered costs, and the remainder of the supply will give a differential which could enter into either profits or wages. I do not, of course, suggest that there may not be some lowering of price on the total supply,

particularly as the lower costs in the range of the concerns which are benefiting will induce them to increase their total contribution to the output, and get their profit not merely from the higher differential per unit, but also from a larger number of units. If the conditions of wages are settled for the industry throughout by a union rate, it is unlikely that any of this differential will go immediately into an improved wage for these concerns. If, however, they have an automatic profit-sharing scheme, it ought immediately to be felt by them.

But, in general, in so far as the wage is settled upon purely economic lines by the total product of an interchangeable marginal worker whose employment in the industry just pays for itself, then obviously the new improvement cannot become part of the general wage immediately. But there are circumstances in which it will be more advantageous to the worker in the long run for the differential to go entirely to profit. Suppose that the standard wage is at its full marginal level, but that the industry is in a constrained position and the yield to capital is below the competitive level, then the industry will be unable to raise new capital on favourable terms for expansion, and will fail to keep up with the demands of the times. In this way its product will become out of date, the scope of the industry will contract, and both the level of wages and the number receiving them may tend to fall off. Where the results are subnormal, therefore, it may be in the interests of the wage-earner for the whole of the improvement to go to his partner in the industry, if one looks at the long-run advantage. Something of this point of view has been put up in reference to the railway. "Here is your job; it is no longer something that you can take or leave as you like and that will be there whatever you like to do about it." Railway receipts are shrinking, and the job itself may vanish unless all parties co-operate to preserve it. Clearly, the first essential of the situation is that it should be maintained; and maintenance depends upon adequate capital renewal to meet modern requirements.

10. Conclusion

The gains of the smoother running of an organisation are not strictly distinguishable from material economies, but, broadly, they are economies in overhead expenses rather than in direct working expenses, like economies in coal and oil or damage. Such overheads have the general characteristic of being a relatively heavier burden in times of depressed trade. In the case of the peculiar " compensating " provisions of the Standard Revenue for Railways, where charges have to be advanced more than in proportion to the deficiency in receipts, the corresponding relief is obviously progressively in favour of lower charges, and thus in favour of improved general trade—a kind of acceleration. Thus on the L.M.S. Railway, if this class of co-operative saving could be evaluated at £2 per man, it would produce over half a million pounds, and in the first instance make railway ordinary capital more attractive, and in the second save a material increase in charges. At times, when the Standard Revenue has been exceeded, four-fifths of the advantage would go to trade and industry.

In conclusion I might perhaps sum up a mass of detailed results by saying that the results of the co-operative movement in industry are the best illustration of the solidarity of industry under modern conditions, inasmuch as these benefits cannot be confined to any one section of the community.

APPENDIX

CONFERENCES OF OPERATING STAFF

Resolutions

(1) That this meeting welcomes the declaration of the Company's policy, which is in harmony with Trade Union policy, and undertakes to use every endeavour by mutual co-operative effort to further the business interest of the L.M.S. Railway.

(2) That in furtherance of the adopted policy, arrangements be made for early meetings of the Local Departmental Committees at every place in the area at which they are established, for the

purpose of mutually considering the various methods by which it is thought the common aims can be advanced locally.

(3) That if, for the purpose of departmental co-operation, it is deemed desirable that two or more Local Departmental Committees in one town should confer, arrangements be made for a combined meeting of the Committees interested.

(4) That if arising out of the discussions at meetings of the Local Departmental Committees, it is mutually deemed desirable that any questions of interest affecting the Railway generally should be centrally discussed, meetings of the Sectional Council or Councils concerned be held for the purpose.

(5) That every individual member of the staff in all departments of the service be urged to give all possible assistance to their representatives, and to use every legitimate personal effort in furthering the aims and objects of this movement.

CONFERENCES OF SHOPS STAFF

Resolutions

(1) That this meeting welcomes the declaration of the Company's policy of fuller co-operation between the Officers and the Staff, which is in harmony with Trade Union policy, and undertakes to use every endeavour by mutual effort to further the business interests of the L.M.S. Railway.

(2) That early meetings of the Shops and Works Committees be held at every place at which they are established, also of the Departmental Line Committees, for the purpose of considering the various methods by which the policy of closer co-operation can be advanced.

(3) That if it is deemed desirable that Shops or Works Committees representing men in different Departments in one town should confer on matters of common interest, arrangements be made for combined meetings of the Committees concerned.

(4) That this meeting makes an appeal to every member of the Shops Staff to give all possible assistance to their representatives, and to use every legitimate personal effort in furthering the aims of this movement.

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AMALGAMATIONS

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AMALGAMATIONS [1]

Amalgamations—the Trend of Modern Thought

Amalgamation is the blessed word of the day. It is blazoned by the popular press and is the slogan of all political parties. We are either saving dying industries by plans for new combines, or pulling recent amalgamations up by the roots to see how they are growing. The last President of Section F of the British Association devoted his address to the Rationalisation of Industry, and various new works are constantly appearing on Cartels, Combines and Trusts, and the differentials of large-scale business are part of the regular studies of economics. I have no desire to enumerate, still less elaborate, the ideas and classifications in this literature. But, so far as I am aware, no economist has written after working from within outwards, and I can at least claim to have had a small share in what it is now the fashion to call *emergent evolution*, forming a single organic industrial whole in seven years, out of thirty to forty entirely separate competitive businesses in every stage of progress and decay, and to have had close business relations with other combines in course of development, to say nothing of my present preoccupation in trying to realise some of the economies of amalgamation in an earnest endeavour to justify some of the glibly given and blithely estimated promises of politicians.

The financial and legal aspects of those experiences I propose to leave on one side altogether on the present occasion, nor shall I recite the external forms of combination in price arrangements, pools, cartels, trusts, holding companies, mergers, etc., and their respective merits, nor give lists of strong and weak points, nor deal with horizontal

[1] Presidential Address to the Railway Student's Association, London School of Economics, 1927–8.

forms, and vertical forms, and tariffs as the mother of trusts. I shall devote myself to certain special and present points of view that are not commonly found in the text-books, and more especially to the cultivation of a more practical mode of thinking :

First, the internal and external reasons for the present state of public opinion.

Second, the economic way of looking at these questions as they develop, and

Third, some comparisons between industrial and railway amalgamations.

The public attitude to combinations has markedly changed of late years, and thus it is quite within the bounds of possibility that with changed circumstances it may change again. Professor Macgregor's presidential address deals very explicitly with the present position.

You may have had two big businesses side by side, and yet have found *in the past* a curious difference in the public attitude towards them. One may have had small beginnings, and by continual success and expansion have spread itself into various areas and various lines, retaining its control and identity; the other may not be distinguishable objectively—because both are large and consisting of many establishments and diverse interests—and may have come together as an amalgamation of many small parts, secured single control and be in all respects, for the present and future, like the first. But the first is " business success " at its best, the " pioneer " and the " backbone " and all the rest of it, but the past history of the latter makes it a " combine " or " trust," with all the semi-unpleasant implications of that title. Their power for good or ill in the community may now be identical, though as to the past the bigness may have come about in one through merit and strength, and in the other through weakness and inefficiency of its earlier parts.

Moreover, a big business, self-grown, has been through the entirely pleasing process of opening new establishments and employing more and more workers, whereas the big

business resulting from combination has often been through the unpopular process of shutting factories, dismissing, and paying off redundant officers, transferring manufactures, in its process of unification. You need not wonder, then, that one big business has been "enterprise" and another has been "cowardice" or "victimisation" or "monopoly" if it has approached anything like a major section of the trade.

Why Businesses Amalgamate

It is as well to look at the reasons why businesses amalgamate (apart altogether from any common desire to eliminate or reduce competition).

First, they may be prosperous and fully extended, but they discern the reduced costs of common management and of rearranging production into straight and continuous lines. *Securing collective advantages.*

Second, they may be depressed, and with factories all half-full may decide to reduce their now crippling overhead costs by filling half the factories and carrying the cost of the empty ones, either temporarily or for final disposition, e.g., *minimising collective disadvantages.*

Third, an industry may be very patchy, and have some units prospering and efficient, but others struggling and trying to hold the market by ruinous undercutting, which makes prices bad for all. It would pay an orchestra that had two particularly bad performers to pension them off the staff if they could thereby so improve practical public appreciation that their receipts were correspondingly greater, always provided that the two excluded performers did not set up a rival performance in the vicinity. Here it may pay the strong to buy out the weak—prune the industry and then pursue a reasonable mode of life again. It may pay to do this even if they have no new economies in their *own* factories, but concentrate and run the weaker ones. *Absorption.*

Fourth, an industry may be in small units and evenly prosperous, but a big unit abroad may, by superior economies of large-scale production, be able to place its goods into the

same markets at much lower prices, and this may compel trustification where it would otherwise be delayed for a long perid. *The inevitable counterpart.*

Now much depends on the *class* into which the industry falls, what view the public take of the matter. A combine of the first class, such as the Soap Trust, raised at the time the gravest misgivings and public expostulations. Banking was received with qualified feelings and much vocal criticism. Now an industry like cotton spinning in the second class (minimising collective disadvantages) is openly blamed for not realising its responsibility to combine. Mr. Keynes has shown, if not to the point of convincing those interested, at any rate to the satisfaction of others, that the remedy of short-time throughout all factories, while the most natural and humanitarian for a temporary depression of trade, is the worst possible remedy where there is a definite decline or change in demand, and that the sooner one recognises the real nature of the change and puts the requisite production into the smallest physical space for overhead charges, the quicker will the power to compete on profitable lines be restored. At the moment, public and Press opinion is favourable to amalgamation, because it is applicable mainly to depressed and distressed industries, and is regarded as the most humane and economic way out. There is no doubt, too, that on balance public sympathy is quickly engaged for my fourth class, the inevitable counterpart of massive organisation abroad.

If, at any time, we revert to a series of combines made under the first head—that of securing collective advantage—it is quite possible that there may be a recrudescence of ill-feeling. Even at the moment one finds no great public enthusiasm for Drapery Trusts and the like. I should not care to allege, however, that the change in public opinion is wholly due to the plight or otherwise of the industries most under public notice at any particular time. Public opinion has been modified by certain internal facts and aspects, *i.e.* factors in business management. No one who has studied the course of public opinion on the subject of Trusts and Amalgamations over the past forty years can fail to be

struck by the extraordinary change of *emphasis* that has come to be placed upon the different factors in the situation. It will not be disputed that the early history of Trusts in the United States was such as to create feelings of doubt and dislike, which, like most popular conceptions, long outlast the justification of current facts.

Stress was then laid upon the evils of monopoly, price and quality; on what was called the problem of "industrial concentration," and, thirdly, on the problem of wealth concentration. As regards the last, in the light of facts to-day in connection with amalgamation in this country such a fear or evil is the merest moonshine, for wealth is as widely spread in a multiplicity of shareholders in the modern combine as ever it was in the smaller units which preceded it. Indeed, it may be said that it is probably even *more* widely diffused, since capital ownership is much more widely negotiable and interchangeable in the shareholdings of a large company.

The so-called monopoly problem of price was still being discussed forty years ago in the terms of the early seventeenth century. A leading case (Darcy *v.* Allein, 1602) gave the position graphically.

> "First, the price of the same commodity will be raised, for he who has the sole selling of any commodity may and will make the price as he pleases. . . . The second incident to a monopoly is that after the monopoly is granted the commodity is not so good and merchantable as it was before; for the patentee, having the sole trade, regards only his private benefit, and not the commonwealth. Third, it tends to the impoverishment of divers artificers and others, who before, by the labour of their hands in their art or trade, have maintained themselves and their families who now will, of necessity, be constrained to live in idleness and beggary."

The question whether large combinations do actually charge higher prices to sell worse quality goods than a number of competing units has been pretty effectively answered in the negative by the facts of recent years. The truth is that the regime of quasi-monopoly and quasi-competition is worse from the point of view of price than either the free competition from which it sprang or the

combination by which it is being superseded. For mere price-fixing associations, necessary as they often were for stable production, brought with them no improvement in research, no reduction in overhead expenses, but the perpetuation of the weakest and the least efficient units; and they generally had as their object the fixation of price at such a point as would reimburse the least efficient concern with the highest costs.

The State of Public Opinion

There is a contrast striking enough between the violent attacks by all democratic leaders and defenders of liberty against oppression a generation ago, and such a pronouncement as that made by Mr. Philip Snowden at a recent meeting, when he treated his subject on broad principles and reviewed the effect of amalgamations of separate concerns on elimination of waste, on price of commodities, on profits, and on the relations between capital and labour. He sketched how amalgamations might become a factor for international peace and for cheaper production, and pointed out that if trusts and amalgamations ever tended to exploit the community this might encourage State interference and State control. He looked on the movement without any feelings of disfavour, hostility or opposition.

Four important factors have emerged, which are either new, or, even if they existed before, are so differently emphasised as to amount to new factors, and these are probably adequate to account for the different attitude of public opinion.

The first factor is the growth of a finer public spirit in treating industry as a service to the community. It is obvious that with a widespread ownership through tens of thousands of shareholders, as in the case of recent British amalgamations, those temptations to, or opportunities for, personal cupidity that were at the bottom of the original abuses in the United States are entirely absent. Those who lead are fully conscious that the interests of the shareholders cannot, in the long run, be secured if the interests of the community are sacrificed. Just as surely the public realise

that sacrificing the interests of an investing public could not, in the long run, be a useful service to the community. A fair balance of interest between the two bodies of people who are in fact largely identical is an ideal in modern industrial leadership. The abuse of this, under conditions of potential new competition, is its own nemesis.

The second factor is the emergence and public recognition of the importance of overhead costs as an element in final price. A hundred factories half-filled or filled with duplicated production and a multiplicity of service officials must inevitably have a far higher oncost than would fifty scientifically selected factories working to full capacity, specialised to particular lines, and assisted by effective service departments commanding the best skill.

A market which succeeds in keeping alive a haphazard group of units must necessarily do so by unprofitable regard to the highest marginal costs. This it may do by price arrangement, but even if there is free competition, those who are weeded out may succumb for reasons of financial backing and staying power, and not because they are intrinsically—given an even chance—the worse units. Amalgamation affords an opportunity for scientific distribution of manufacturing power, and for elimination of producing units to be done strictly on its technical merits.

The third factor is the perfecting of cost-finding as an aid to industrial management. When related to processes, this is almost entirely a development of the last twenty years, and it enables very accurate comparisons to be made between different producing units, so that not merely the *total* cost, but all the processes entering into the cost can be directly compared in producing units widely separated. This enables each unit to learn something at some point, from another, and does not allow us to rest content with the old fallacious view that because two factories working under different conditions had a similar resultant cost, this cost was not susceptible of further reduction, and that " all was for the best in the best of all possible worlds."

The fourth factor is the development of the technique of management to suit large and diversified units, such as

amalgamations produce. It is known by experience to a much greater extent than formerly what types or degrees of centralisation and decentralisation are suited to the conditions of combines, the early history of which illustrated the shortcomings of a mere continuation of localised paternal control or of the substitution of highly centralised dictation.

II. Economic Aspects of Amalgamations

The amalgamation of coal mines is, of course, not strictly analogous to the amalgamation of industrial establishments or transport undertakings. The economies of control and service departments may be available; those of distribution could be obtained without amalgamation, but none of the ordinary advantages of large-scale factory changes is available.

The closing of a mine, unlike the closing of a factory, means the definite abandonment of a corpus of natural wealth which may become economic wealth by the trend of prices in a way that could never be expected of factory establishments. The restrictions due to geographical position are unescapable and make the case much more akin to transport amalgamations than factory amalgamations. When I say "akin" I still mean to recognise a profound distinction in that, where the strong line absorbs the weaker line, both must generally remain open, but the cries for coal-mining amalgamations are proceeding mainly on the assumption that it is the most humane way of pooling the costs and risks of reducing the industry in magnitude.

Of this humane method let me take an example:

The chemical and engineering groups find themselves opposed by foreign groups of immense strength, and, although having no special extremes of obsolescence or efficiency themselves, seek to match up the great foreign aggregations in self-defence. It is not here a question at all of potential output largely exceeding demand and compelling concentration. But long before the end of the war the explosive manufacturers realised that there would be a greatly excessive output capacity, and that the contributing

units were putting their products into the market under very dissimilar conditions—some having expensive modern plant and good wages in industrial areas, with economical production, others reaching equal cheapness by rural labour at remote agricultural rates, ancient methods and appliances whose capital cost had long since been amortised. It was clear that a number must go under, and it was agreed to pool the risks and costs of concentration by a straight-out amalgamation on the basis mainly of pre-war profits. The first six years of this merger saw the closing of the majority of the smaller factories and concentration and specialisation of manufacture in the best and most advantageous manner. To be more exact, 55 per cent. were closed, and the majority of them finally disposed of for other purposes.

I find a general tendency in popular discussion to exaggerate the simple economies of straight-run standard lines possible through concentration, and to underestimate the costs of bringing them about. I have exact details of the reduction in the cost of a specific product brought about in six years, and find that of the operative costs—that is, excluding the materials—there was a saving for efficient methods of about 16 per cent., or one-sixth. This, however, as a percentage of total cost, which alone could be reflected in price, was only 4 per cent. Moreover, it is impossible to disentangle the saving that might have been made in any case apart from combination—the saving due to straight runs, and the saving due to larger possibilities of research. But an interesting case of the concentration of two factories in one, where the larger factory was making 87 per cent. and the smaller 13 per cent., gave an effected saving, through closing the smaller unit, of $6\frac{1}{4}$ per cent. on the total manufacturing cost. In these circumstances the cost of the smaller unit was 47 per cent. higher than the cost of the larger unit. In another instance in which concentration of specific manufacture of a highly mechanised product was expected to produce straight run savings, the total savings in factory overheads and administrative expenses, after allowing for interest on additional

capital involved, came to between 6 and 7 per cent. on the price.

If I had space I would like to give you an objective picture of the effect on the whole community of an industry, failing combination, pursuing the weaker units to their economic elimination, the whole industry mainly running on sub-normal prices and depressed profits, being unable to raise much capital for new developments or afford much research. In this case the community for some years enjoys subsidised prices at the expense of fast-vanishing capital values, and I should like to contrast this with a method of voluntary amalgamation, where the price is kept up to a point which is economic for the best units, and is also loaded with an amortisation of the worst units until they are wiped out. Here the public for some years pay a higher price for a product, but inasmuch as the amortisation costs include a reasonable amount of dispossessed skill as well as capital in general, the community gains in steadiness and ultimate economic value although for a time it has forgone a temporary advantage. Viewed objectively, even the advantages of the economies of concentration are obvious, but it is very expensive to bring them about. A factory is hardly ever ready to provide the output of another without changes in layout, alterations in power and consequential changes, and there is also the annual equivalent of the capital cost of displacements from the closed factory. It may very well be that the advantages of concentration will not pay for the increased charges, and it is only where those advantages are markedly in excess that objectively it is economically justified. There must, however, be thrown into the scale the advantages (which are incalculable in both senses of that word) of large-scale research, and this may quite soon change a minus result of the transfer to a plus one. Generally speaking, for railways the costs of transfer are materially greater in relation to the revenues involved than they are in factories. The adaptation of a single station in place of two to secure economies of working may be very costly, and the substantial offset that one often gets with disused factories applied to other purposes is rarely available in the

case of railways as a deduction from the new cost. People talk glibly about economies, but it is not realised that physically they are often most expensive to bring about and need considerable capital resources.

The Ultimate Effect of Economies

(*a*) *Large-scale Buying*.—I do not so much desire to make a detailed survey of the various changes and economies brought about by amalgamations, as to suggest a *technique* of consideration—a way of looking at them as they develop which may more definitely determine their value to economic society than our present detailed and "first-impression" method is likely to do. For we have to examine carefully to see in each case that what is clearly discernible as a gain to the amalgamation is necessarily a gain to the community, that x accruing to the combine is not merely x deducted from others. To do this we must inquire exactly whether in the transition some desirable or necessary object is achieved with less human effort or real cost than hitherto. For example, take the commonly alleged economy in buying in large quantities—the ability to get a finer price than smaller customers could do. What is the real objective change? It may well be that a supplier, anxious to get so large an order, will sacrifice something of his gross profit per unit to secure the larger aggregate. (Let us assume there are no manufacturing changes involved.) Where a previous £1000 was received by A and B from C and D, now B alone gets £950 from the combined C and D. A and B have the same overhead costs, and £50 made by CD has been lost to A and B together, though B gains the whole order at the expense of A. And there is no other objective change. In time, however, the weaker A's may be driven out of business in favour of the stronger B's—that is, a tendency to fewer and larger units in the supplying trade. With a lower percentage of overheads these can literally *afford* the lower price in time, and restore the original marginal unit net profit. Thus the transfer of the same units from suppliers to CD can take place at no loss of net profit to the suppliers, but at less working cost to them, in human effort

and fixed capital, and the whole community has gained. But the community has no net gain until the dispossessed capital of the weaker A's has been amortised and the dispossessed skill carried over into new uses—both being special displacement costs.

(*b*) *Transfers of Purchasing Power.*—I am still accepting the original assumption on the human side, that the quasi-monopolistic position now enjoyed by the larger B's (or the rationalised industry AB where the depressed A's have been absorbed) is not abused—in other words, that CD does not find, when confronted with *no free choice* amongst suppliers, that the absence of A and B competition means once again a higher price. If so, CD may lose the gains of AB concentration wholly to AB. But, either way, in the long run the community will have gained. All I wish to make clear, however, is that mere economy in buying for the combine CD is of no advantage to the community in itself. Of course, if a combine CD effects an economy, whether passed on to its shareholders in better dividends, or to workers for wages, or to purchasers in prices, giving each respectively greater purchasing power or greater real income, the presumption is at least pretty strong that it is *also* a communal advantage. But it is at least possible that the economy is only a gain by one communal section at the expense of another communal section. For in the AB section, at whose expense the economy has been made, the deficient results, whether felt by the shareholders in smaller dividends or workers in smaller wages, may mean reduced purchasing power or real income, *pro tanto* to CD's gain. The position is not essentially altered where foreign trade is involved. Let us suppose CD's new economy x has the effect of enabling CD to obviate extinction through growing foreign competition—we should hail it as a national boon, even if the AB section had lost the x, unless AB were thereby put out of business in foreign markets by its new disability. If AB were a home trade, we should have said in effect, "Let AB be rather less prosperous so that CD may be preserved to the nation's activities." And this looks like a good policy. And it *is*, if needless disturbance

costs can be avoided. For remember, if CD is to be wiped out by the competing goods of foreign supplies, some home trades E and F must have increased activity to pay those foreign suppliers in goods, and the ruined CD may in due course transfer capital and personnel to the increased EF. The upshot of this argument is that an economy belonging to CD, while it remains a monetary *transfer* and has not set up a *reduction* of human effort in AB, is of no necessary communal advantage.

(*c*) *Advertising Expenditure and Progress.*—Next take the case of advertising. Advertising, in the first instance, is *informative*, bringing production to the notice of people with a want for it—informative advertising is an integral part of the production merchanting process. In the next stage it is *creating and suggestive*—not merely bringing information to X, who wants the article, as to where he can get it and how much it is, but *creating* a want or habit in Y, who had never heard of it before. In certain economic conditions, which I need not here detail, this created want in Y is merely a transfer of spending power from an old favourite or habit of spending to a new—it increases one business as it depresses another. X wanted a certain reading lamp, and the advertisement completes the link between manufacturer and consumer. Y wasn't conscious of the want till he saw the advertisement, and now he transfers his demand from gramophone records. But under certain other economic conditions creating and suggestive advertisement is of high economic value. All purely economic progress postulates reduction of human effort and capital to produce a particular unit. When this economy is effected, purchasing power is released which may not be wanted wholly or at all for more of that article. But the same economy has put someone out of work, and *progress* postulates a continual rise of new wants to put him back to work. A new want is found—the supply of it puts him to work—the new supply is the missing mate, but the waiting purchasing power has to have its want created and suggested before the match is complete. Thus suggestive advertising—" eat more fruit "—may be a mere transfer, but

it may also be a *time-shortener* in the lag between the disturbing effect of devices for economy and the advantageous results of it—a rapid adjuster between released purchasing power and new objects of desire creating new production.[1]

The next stage of advertising is the percussive, the brow-beating or psychological—"*B's tyres are best,*" or even "*Buy B's tyres.*" As a general *group* of advertising this has some of the qualities of the foregoing, but in the main it is attack and defence, which does nothing for production in the aggregate. It is easy to see that the community might easily waste too much of its effort and material in this direction, and that clear gain results to total communal effort by diminishing it. Of course, to the advertising experts, or individual interested trades, all forms of advertising that increase the profits of their clients are almost equally advantageous, but the *economic* results of different types are very different. As a matter of fact, much of the expenditure subsidises a "*news-service*" which is intrinsically given below cost price, and every time we pay too much economically for boots or patent medicines we are compensating for paying too little for our newspapers. It is not, however, a clean transfer, because much paper and type and human effort are uneconomically used, and we could get our newspaper for $2x$ more, our boots for $3x$ less, and have x to spare for some new utility.

As regards the amenity of newspaper advertising, I suppose some people like threading their way through a drapery catalogue to extract meagre items of news. Personally, after I have got up and finished all the fag of dressing myself, it irritates me to have to contemplate pictures of scores of ladies who have only just begun that process!

Now where a combine reduces its combined advertising, it is of importance *to itself*, whatever the type, but whether it is wholly an economic advantage to the community depends greatly on the type of advertising which is reduced. The disturbance to vested interests may be as great, but the net or final effect on aggregate production is widely different.

(*d*) *Economies in Distribution and Services.*—Economies

[1] *Vide* p. 106 *et seq.*

in sales agencies, a multiplicity of premises and offices and people canvassing over the same ground and taking up the valuable time of intending purchasers, are generally a final economy to the community too. The advantages of competition may be as great with three sellers as with thirty, but how much more wasted and misdirected human effort there is in the latter case !

We have had some indication lately of the economics of waste of distribution methods with coal, where coal carts are covering each other's tracks all the time. It came home to me graphically one day when I heard of a man obtaining a small loan to acquire a coal business, abutting on his own, when he said that the 1000 tons per annum added to his own 1000 would make a comfortable little business. Assuming him to expect to make £500 for himself, and adding the expenses of clerking, offices and cartage, one can soon see how considerable an addition must be made per ton for his services alone—upwards of 10*s*. to get it to the consumer. (Gide, I remember, refers to the numberless bakers of Paris as keeping up the price of bread unnecessarily even if they only meet their costs.)

Now look at a combine which is big enough to run a legal department and give whole-time employment to an officer and staff, instead of sending all its work out to outside solicitors. The same work has to be got through, and it looks like a simple transfer, without effect on the community. Similarly for a whole-time tax expert, or medical man for the staff. The actual money transfer may be the difference between a moderate salary and large fees, which is a plain change over, without final change in purchasing power of the community. As a fact, however, the difference to the community is not in the fees at all, but in the saving of labour in formal correspondence, and the short cuts of constant availability and convenience for principals, etc.

Looking at the whole objective process of securing a given product and getting it into the right hands, those of the people who want to secure it, with the minimum of people involved and capital engaged, if there is clear gain to the community, and if combination brings it about, then

advantage to the combine's interests and advantage to the whole community coincide. The monetary expression of this may take many forms, but that is a problem of lateral distribution only. Generally speaking, human *costs* loom largest to begin with. A railroad may give employment to 100,000 men, and by reorganising and new methods and freedom from restriction may be made to render the same service to the community with 80,000. To shelter the 20,000 by resisting the change is dearly paid for in the long run, assuming they are not undergoing process of absorption to fill natural vacancies, and this is clearly realised if the resistance process is going on in all the industries together.

Effects of Combination on other Industries

It is inevitable that the rationalisation of one industry must affect the content or range of activity of other large units in a different industry. For example, a railway shop mainly engaged in iron and steel work for locomotive and carriage building may have sufficient work in brass or copper parts or bolts of standard types to set up its own section for those parts, and possibly, though not *certainly* in the absence of true costing, manufacture them as cheaply as they can be bought. There may be all the more reason for doing this when railway amalgamation increases the requirements and possibly concentration takes place. Perhaps this manufacture is comparable in size and order with many of the independent units in that trade. But let that trade have a large increase of trustification, with great economies in operation, research and all the rest of it, contributing to rapid advance, new patents and the like. The small factory of a great railway cannot possibly enjoy these advantages, and must lag behind in technique and mass economy. It may thus begin to pay to buy, and shut its own section in due course. To be Jack-of-all-trades is to be outclassed at each point by the specialists. Of course, where transport is of importance, as for obtaining wooden packing-cases, it may often pay a considerable business to have its own box-making plant, even though the prime cost may be slightly greater.

III. Railway and other Amalgamations Contrasted

The transport amalgamation shares with the manufacturing amalgamation the power to make large-scale economies in buying, in clerical and specialised service departments where machinery may be employed, or merely rival services cut out, and long straight runs of service obtained. It enjoys, over a small part of its area, the possibility of avoiding delivery services which overlap and duplication of canvassing and offices, but as it is by its nature occupying different areas which must remain occupied, for the most part, in any case, it can do this only to a much more limited extent. For example, in the Area A of 600 square miles firms X and Y compete over the whole, send their duplicated canvassers over the whole, advertise over the whole and duplicate delivery over the whole. They have this area to themselves, perhaps, through transport costs excluding others. Thus if two half-employed breweries join and one closes down, it may best illustrate the point. On amalgamation the duplications may be almost entirely eliminated. Suppose railroads P and Q traverse this area, joining large centres at its two extremes, and diverging by ten or fifteen miles *en route*. They may have wasteful competitive traffic with trains half-full of passengers, or underloaded freight trains, but on amalgamation a judicious pruning and combining may give the public at the big towns much the same facilities. But both lines and establishments must remain open, with fairly full costs, and the service of local stations and their immediate district must go on. The competing points that lend themselves to economies are a minority of the whole geographically. The very spacing and fixity of railway running prevent a true analogy with fluid industrial conditions both for manufacturing and delivery.

The Effect of Large-scale Industry on Railways

The question of magnitude and co-ordination of industry generally in its effects on transport, and particularly on railways, is obviously of considerable economic importance.

There will be several influences at work, not all in the same direction. If the main industries of the country were to become standardised on a large-scale basis, for a given quantity of goods equal to the present quantity there must obviously be : (1) a less total mileage for goods. We should not find the articles of practically identical use and form coming from opposite ends of the country crossing each other *en route*, as they must do under a small-scale system of competition. (2) This less total mileage, however, would be offset by a longer mileage for specialities made under conditions of mass production. For example, if the wallpaper combines make special lines of paper at each factory, instead of a multiplicity of lines at each factory, it is probable that the advantage of mass production in straight lines is partly offset by a longer average haul to destination. (3) While, therefore, there is less mileage, through co-ordination and cessation of overlapping, there is more arising through specialisation. (4) On balance, I have little doubt that the former would prevail, but this less mileage would be less costly if carried for large concerns, because there should be a tendency to fuller and more constant loads and more regular routes; the handling and auxiliary terminal charges being correspondingly less. (5) Against this, the combines will find it easier to command their own resources for rival forms of transport, but these are less likely and less economic than they appear to be at first sight. At the present moment these rival forms are working under special uneconomic conditions. They do not appear to be bearing their full costs of the maintenance of their track and guidance and the costs of the disabilities they set up. They are not working under standard conditions of labour restriction and in many cases they are not covering their secondary and supplementary costs—that is to say, their long-run depreciation and obsolescence. When these factors have been shaken out into equilibrium, a truer economic comparison can be made. (6) Moreover, the railways are developing important new advantages which go far to offset these, and firms are finding it convenient to have rail-head establishments which act as centres for stores, instead of carrying either piecemeal

by rail or still more piecemeal by road the whole distance to their retail customers. (7) The constant tendency to eliminate all packing costs, with immense saving of time and material and liability to breakage and pilferage, and the substitution of containers, which may be filled on the upper floor of the factory and not touched until they are unloaded at destination, is a further tendency in the same direction. (8) Against this tendency, however, is to be set the still continuing tendency for miscellaneous merchandise to be sent in smaller lots, due very largely to the shifting of credit arrangements and the inability of the final distributor to carry large stocks and to take the risks of price-change. To order frequent and small packages is a continuing tendency, which may, however, be checked as the price level becomes stabilised and retail capital more adequate.

So far I have referred only to the changes set in motion by amalgamation in dealing with a given quantity of goods, but by hypothesis the amalgamation forces are making for true economy in human effort, and that is for larger real purchasing power. This must mean increased production of goods of existing types and new types. Again, by hypothesis, the production of these is localised and specialised, and the new class of goods, therefore, should have, on the whole, an average haul of considerable length. Space fails me to pursue the influence of large-scale amalgamation upon transport, but these are some of the broad tendencies which have to be followed.

Railway Amalgamation in America

My own experience of the American view-point on amalgamation, so far as railways are concerned, is that it is much less acquiescent than in the case of manufacturing establishments. I think it is easy to exaggerate the extent of the conversion of public opinion in the United States, particularly in regard to railroads. I have talked with heads of many companies in the States, and formed the general impression that they consider the compulsory consolidations that were suggested some years ago, and that are now in mid-air, not to be the best way of tackling the

problem. None of the strong lines approves of the apportionment of weak ones on that plan; they prefer to follow the line of least resistance, and amalgamate along their own lines and according to their own interests, for some time to come; eventually, of course, the weak roads will be left high and dry and relatively much weaker than ever, and it is thought that at that stage there may be compulsion to allot these roads to the strong groups. But while this is a theory that has been held out, there is no sign that it is being really effectively carried through at the moment. Most of the voluntary combinations that have been put up for consideration, so far from being accepted as instalments on account, have been refused. Thus the first scheme for the Nickel Plate Consolidation was refused. Loree's merger of the Cotton Belt, the Missouri Kansas and Texas and the Kansas City Southern was refused. Third, the New York Central scheme for making a closer consolidation than the present holding company was refused. Fourth, the Loree scheme for the Delaware Line to control the Buffalo, Rochester and Pittsburg Road was turned down, and I understand that two present cases, Wheeling and Lake Erie for control, and the consolidation of the Great Northern and Northern Pacific, are in considerable doubt.

So far as regards the strong and practical tendency towards railway amalgamation in the States to meet public opinion, one can say that it is almost non-existent. I would doubt, too, whether American opinion is irrevocably committed to all types of general consolidation. In my own personal business contact with the Duponts and General Motors Companies, I have known at first hand a great deal of their relationships, and have seen public opinion increasingly acquiescent in the activities of this huge aggregation; but the Federal Trade Commission is supposed to be a watch-dog of public interests, and has very wide powers to maintain effective competition. It is at the present time investigating the connection between General Motors, Duponts and the United States Steel Corporation.

The claimed advantages of consolidation have varied considerably with almost all schemes put before the Com-

mission, and it would seem that the latter has not been greatly impressed by these schemes, as it has not permitted a single important one, characterising them "as not being in the public interest." The majority of advantages claimed, however, fall under the following heads:

(1) Reduction of cost of operation—
  (*a*) Through routing over tracks with better gradients.
  (*b*) Through the concentration of the work done by two parallel single-line railways by conversion to one double-line track, *e.g.* the Western Pacific and the Southern Pacific.
  (*c*) Through the reduction of salaried officers, such as Chiefs of Motive Power, Chief Stores Officers, and so forth.
  (*d*) Through the concentration of work at repair shops at present not working at full capacity and the closing of redundant shops.
  (*e*) Through the reduction of empty haulage, made possible through amalgamation by the formation of a triangular trading route.
  (*f*) Through better use of rolling-stock and consequent reduction of rolling-stock orders.
  (*g*) Through unification of terminal facilities, both passengers and freight.
  (*h*) Economies realised through combination of ticket offices, advertising campaigns, etc.
(2) Benefit resulting from simplified financial structure, leading to better credit and lower price to be paid for new capital.
(3) Greater competitive power (which has produced keen opposition from neighbouring railways).
(4) Purchasing on a larger scale, with consequent better bargaining power.

It will be seen that standardisation, a cause of such large economies in Great Britain, is not included, for the reason that it is already attained through the American Railway Association.

Conclusion

In conclusion might I say that these observations have been addressed mainly to those who have a double interest, viz., in the study of railway matters and the study of economics—that is to say, to the young students who are building up a mode of thought in these matters, and whose influence on the development of public opinion in the near future will be so great. While no doubt primarily these studies are directed to securing intensive knowledge and greater efficiency within the field of transport itself, at the same time it is to them we have to look for " extensive " knowledge, or opinion which relates that great industry to the national economics. These links are the weakest of all, and if I can encourage the art of thought in connection with them, that is all I have now set out to do. I have certainly not intended to educate in any way the formidable corps of advanced talent and high position in the railway and economic circles, though I should dare to hope that here and there one or two among them might even go back over their own mental tracks and make a new analysis of the economics of concentration and amalgamation.

VI

STIMULUS

VI

STIMULUS [1]

I. The Idea of Stimulus in Economic Life

There is no term in more constant use in current discussion of our economic life and its direction than "stimulus," loosely employed to serve various distinct meanings. We hear of a change in the bank rate stimulating trade, of a reduction in the income-tax stimulating enterprise, of an increase in piece rates as a stimulus to the worker's output, of some share in profits being required to act as a stimulus to labour interest, of rising prices as a stimulus to business. Indeed, nearly every change in economic factors is, or can be, reduced to terms of stimulus (or its converse) to existing conditions. Locarno or the latest news from China may "stimulate" the Stock markets. Static economic conditions do not interest us to-day nearly so much as dynamic changes and their effects. I have chosen the word "stimulus" rather than "incentive" because incentive is too closely akin to motive, and it is essentially the change in the *degree* of incentive, the *increment* in incentive, that I wish to examine. It plunges deep into the physiological and psychological nature of man, into the physical nature of matter and into the profound interactions of these three. No specific examination of the action of stimulus, abstracted from its particular manifestations, has to my knowledge been made. Within the limits of a Rede lecture I cannot make it; all I can do is, in the words of Bacon, to tinkle a bell "to call the wits together." All I can do is to throw out some of the essentials of an inquiry, which is not so much something to be independently undertaken, as a feature to be

[1] On Stimulus in the Economic Life: The Rede Lecture at Cambridge, 1927.

watched and noted in the course of general economic study. Only the catholic interpretation of this Rede foundation could possibly admit a lecture so greatly deviating from its main type. But in 1893 Sir Michael Foster addressed himself to "Weariness," and a few years before Sir Francis Galton spoke upon the "Measurement of Human Faculty," both of which subjects lie upon the confines of my own.

First, then, "Stimulus" must be carefully distinguished from incentive and enlarged scope. Incentive may exist ample to take full advantage of the whole range of possibility that conditions allow. If conditions are made wider or easier, the same unaltered incentive may serve to achieve larger results, and no increase in that incentive is required—no stimulus to increased or intenser action. There is more confusion of thought upon this distinction than almost any other. A lower rate of general interest is popularly supposed to be good for business, and make for more enterprise. But it does not do so necessarily by stimulating or inducing greater energy or risk-taking. Let us suppose that the cream of new enterprise (or extension of existing business) is so advantageous an improvement upon existing methods as to promise a definite advantage which will yield 20 per cent. upon the capital involved. This class of enterprise will be undertaken whatever the current rate of general interest, for it obviously affords an ample margin. There will be a downward gradation extending in number or magnitude. Thus those offering advantages of 10 per cent. may be twice as numerous; those with $7\frac{1}{2}$ per cent. four times; those with 6 per cent. eight times; 5 per cent. twenty times; 4 per cent. a hundred times; 2 per cent. five hundred times, and 1 per cent. a thousand times as many. The chief way in which interest on capital is produced is when capital invested in fixed forms, by a roundabout or delayed method, supplies more commodities than a direct or immediate method, and the surplus, or advantage, if large, is a source from which high interest can be paid; if the new method is only just a bare improvement the interest must be small.

These unborn opportunities for business men are mutely making bids for any capital that is offering. The richest

openings make the highest bids, and thus become objective realities. If no capital is willing to come forward for less than 10 per cent., all those very numerous "one-talented" possibilities that could not afford or produce 10 per cent. remain unborn. If capital offers at 5 per cent., an immensely larger number become alive, but there is always a considerable field of untapped potentiality below the current rate. Suppose a company to be the owner of a number of tin-mining propositions of varying degrees of richness of yield, so that if tin is £150 per ton it will pay to work only one, but if tin is £300 per ton it will pay to work them all. The purpose of this company is to make all the money it can—all that conditions will allow it to make. This *incentive* is just as great whether two or ten mines are possible. The change in the price of tin is not strictly a stimulus to greater production; it is an automatic enlargement of scope within which the same incentive may work. A lower general rate of interest is an automatic enlargement of scope. The water flows automatically into the new conduits without increased pressure. (It may indeed have, in addition, psychological influences upon willingness to work, or save, which may be true stimulants, and this we must examine later.) The supply of capital, however, in relation to the rate of interest obtainable, is also graded, but in the opposite direction, at any particular time. Although there are certain kinds of savings which tend to be greater if interest is low, and certain kinds which tend to be indifferent to the rate, still, taken on balance and as a whole, at any given moment, if interest offered is high the total capital supply evoked is larger than if the rate is low. In so far as saving is the result of abstention from spending, which is made worth while by the reward or price, many people would not deny themselves present pleasures of spending for a return of only 2 per cent., but they would do so gladly for 15 per cent. Thus the capital *demanded* by ventures which could make 2 per cent. or more would be very large, but the capital offered at 2 per cent. would be very small. Similarly, the capital offered for 20 per cent. would be very large, but the number of ventures that could pay it are few and the capital actually changing hands at this rate would be therefore

relatively small. At some intermediate point there is a rate of interest at which the amount of capital people will offer for such a rate (or a higher but not lower rate) is equal to the amount of capital demanded by businesses which can reckon to produce that rate or more. That equation of amounts automatically determines the rate. And if openings for business never varied in their gradations of possibilities, and if the motives and opportunities for saving capital never changed, that rate would not change. If something happens on the side of the supply of capital—something affecting people's willingness to save—so that a much larger amount, say 20,000X, can be offered at the old rate of 5 per cent., instead of 10,000X, and 15,000X is offered at $4\frac{1}{2}$ per cent, and 10,000X is offered at 4 per cent., then the equation with the old scale of opportunities is found at a new point. Suppose the scale is as follows :

Businesses which could produce

6	per cent.	or more	would take	5,000X	capital.
5	,,	,,	,,	10,000X	,,
$4\frac{1}{2}$	,,	,,	,,	15,000X	,,
4	,,	,,	,,	20,000X	,,

Then the change in the supply of capital brings about an equation with demand at $4\frac{1}{2}$ per cent. which becomes the new normal rate. Thus if the rate goes down, the scope of business is automatically enlarged. But the rate may go down (or the supply be increased at a given rate) automatically or as a result of some special stimulus to saving. So when we say, " If the rate were lower it would stimulate business," we are putting the stress in the wrong place, and we could more accurately say, " If some cause could be found to stimulate a greater supply of capital at given rates (or the same supply at a lower rate) more business would be physically possible." It becomes a matter of importance, then, to consider the motives under which saving takes place, and particularly how a change or increment in incentive changes the saving.

But it is not to be supposed that the other side—the potentiality or offer for capital—remains unchanged. Research, invention or discovery may alter the whole gradation, or open up new potentialities which increase the number of

businesses that could produce *X* per cent. or over, and therefore the total capital demanded at *X* per cent. The love of adventure, the microbe of scientific curiosity, the desire for fame, may be in the aggregate a constant incentive, and the supply of these ingredients may be in regular undisturbed operation in the economic sphere, keeping the gradation to which I have referred at a regular or constant level. But if a sudden increase in worldly honours, or in popular appreciation attaching to a life of success in research, increased the numbers of those turning to this life, or could conceivably redouble the efforts of those already devoted to such a life, the flow of this ingredient in human progress might be enlarged, and the gradation of potential " offers " for capital completely lifted or altered. In this case the rate of interest might again be changed as the automatic result of a new equation between an unaltered range of capital " supply " at particular rates and an altered range of capital " demand " at particular rates. It is often quite elliptical to say that business is " stimulated " where the scope of business follows automatically or arithmetically upon the ruling conditions. Stimulus may indeed be operative somewhere in modifying one of those conditions, but those conditions are constantly altering without conscious stimulus being responsible.

Take the case of a goat tethered by a 20-feet rope to a pole in a field. Within the scope thus afforded it finds its sustenance. Let it be assumed that the feeling of satisfaction when it will lie down and cease to eat is the result of obtaining a definite quantity of food. Then if it obtains that easily and quickly it will work for a shorter time than if the crop is sparse and mean. To lengthen the rope to 40 feet will not change this "incentive," and it is no stimulus, but only an enlargement of scope, which may or may not result in shorter hours, according to the comparative richness of the old and the new areas. But suppose that working within the original circle the goat could not really " satisfy " itself physically, using all its time, and remained tired and under-nourished. Then the lengthening of the rope is once more only enlargement of the scope within which the existing and potential incentive can be satisfied. It is no change in

that incentive, and no real stimulant. Unless indeed from scraping for a living the sudden change to lush grasses easily obtained tempts the goat to over-indulgence, and a change in the definite quantity of food required. This stimulus may make a permanent change in habit. It may be merely temporary.

Again we must distinguish stimulus, as an increment in incentive, from a mere " shake " which gives the opportunity or occasion for the realisation of a scope that is already existent. This is a sense in which the word is often used. For example, it has been said by the economist, in the long discussion between the " economic " and business views on the incidence of income tax, that it is economically impossible to add the tax to existing prices, though where, through custom or inertia, existing prices for particular things are not as high as they might be forced, the tax will act as a goad to discover the hitherto unfound areas of potential increase. That is, many a " stimulus " merely shakes the frictionary elements out of the existing situation, and oils things into their true places.

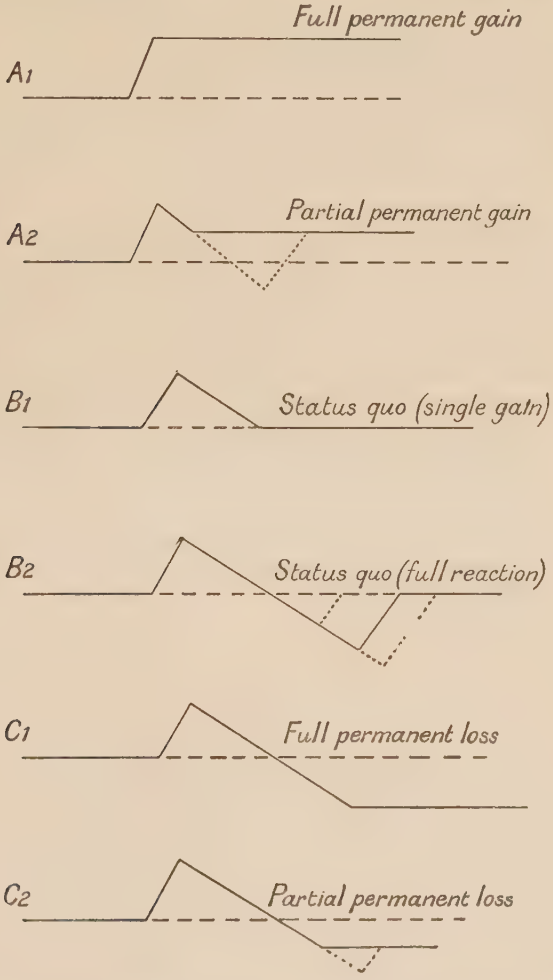
Again, we must consider the stimulus which supplies no energy, but promotes the release of such energy as exists latent, like a detonator, or a catalyst in a chemical process, as distinct from something which is a real addition to the other agents, such as many types of fertilisers. In so far as stimulus supplies only release, and not fresh energy, it may be said to imply the ideas of reaction and of exhaustion, for it may have provoked only the using up of a stock, or at least some taking from the stock which may or may not be renewable.

Of what order or orders is stimulus in the economic life?

2. A Provisional Classification of Stimulus according to its Results

It will be of assistance, before setting out on an inquiry, to classify the chief possibilities, on abstract considerations, of the results of stimulus. The classification will serve as a means of test and of record.

If we view the normal working of natural forces as a straight line, with or without a growth "trend" (or as a wavy line with rhythmical fluctuation), we may set down



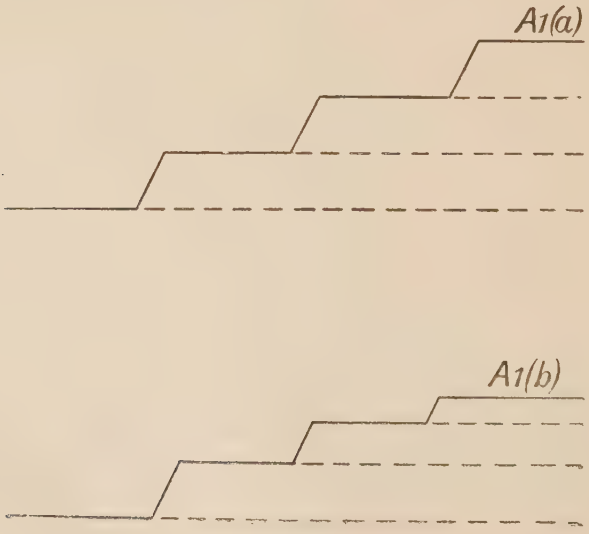
the different conceivable consequences of "lifting it" artificially by a stimulus in three main classes. Let us take the results of a single application of stimulant. It may be permanently lifted in achievement, with or without sub-

sequent loss, then following a course parallel to its old course. This may happen to the full extent to which it is urged, or it may sink back partially, after reaction of varying extent. This class A we may call the *Permanent Gain*, Full (A 1) or Partial (A 2) as the case may be.

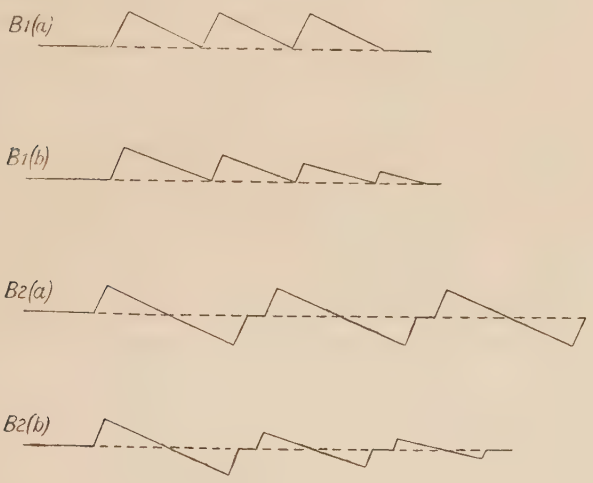
It may lose the effect and gradually sink back to its normal line, pursuing its old course. In this case the gain is limited. Or it may, before resuming its original course, react below the normal for a time, and thus lose all or part of the special gain. This I will call the *status quo* class, B 1 a single gain, and B 2 full reaction.

The third class, C, is the converse of A, for the reaction is such that the line of effect is resumed below the normal, to a greater or less extent—*Permanent Loss*, full or partial.

If we now consider the possible effects of repetitive "doses" at intervals of time, something depends upon whether the interval is so short that the results in A are not fully effective. Such repetitive doses may be constant, diminishing or increasing (or cumulative) in quantitative effect. They may leave a permanent strengthening or permanent weakening of potentiality for development after the doses cease. The first two of these three forms applied to A are pictured thus :



B will present a series of constant wave motions either of equal amplitude (B 1 (*a*) and B 2 (*a*)) or of diminishing and increasing amplitude (*vide* B 1 (*b*) and B 2 (*b*) as examples of the diminishing order). Now we may suspect that the changes brought about by stimulus in different fields of experimentation can be subsumed under one or other of these categories.



3. The Different Factors of Economic Life

The economic life is a complex reaction between a physical world, obeying the laws of physics and chemistry, and living organisms obeying more elusive biological and physiological principles, the whole relationship being worked upon by individual and mass psychological and "spiritual" forces. No one can say which factor is dominant in every movement for a change from the economic *status quo*, though the factor of motive seems to be the controlling variable in many measurable instances. But it may be that the inertia of the other elements, or their familiar laws, can have an inevitable effect on the human qualities. Thus if motive were stimulated into doubled action it might conceivably retain that force indefinitely, were it not for the fact that the

physiological or physical adjuncts through which alone motive can be objectively realised have been flogged into unwonted activity, are subject to complete reactions, and pull down the motive or incentive with them. The spirit may be willing, but the flesh weak.

If the economic life is a complex of these three worlds of law, we may hope to learn something of the laws of stimulus by studying them separately in each sphere, either to look for some analogy, or to find the influence of the " ingredient " directly present in the final mixture. It is worth while, therefore, to scan our knowledge in the fields of physics, chemistry, physiology and elsewhere where stimulus may conceivably be observable and measurable. Moreover, we may thus attempt to make an abstraction of the idea of stimulus. Professor Whitehead says that " the utmost abstractions are the true weapons with which to control our thought of concrete fact." [1]

Two biological laws governing the relationship between a cell and an external stimulus acting upon it rather tend to prevent good generalisations of a quantitative character. They are to the effect that one and the same stimulus will evoke different responses

(i) not only from the same cell under different conditions, but
(ii) also from different kinds of cell under the same conditions.[2]

4. The Stimulus of Drugs—An Analogy

It is a commonplace of the popular theory of drug stimulus that to secure a constant reaction with a succession of doses the amount of the dose must be increased, or alternatively, that a constant dose is succeeded by a continuously diminishing reaction. It is the former aspect which is generally included under the description of " tolerance." While the

[1] " Science and the Modern World," p. 41.
[2] Feldman, " Racial Aspects of Alcoholism," *Brit. Journ. of Inebriety*, July, 1923.

literature of the subject abounds in broad indications along these lines, and many qualifications and exceptions, no exact quantitative tests have been made which could be reduced to a definite relationship expressible in a formula or curve. Inquiries from many physiologists and pharmacologists have failed to elicit anything approaching even an empirical formula or quantitative relationship. This is mainly due to the fact that the reaction in question is usually too general, such as a feeling of exaltation or ease, and has not often been measured as the ability to perform a task, or to perceive or to respond to tests, capable of quantitative expression. Man becomes quickly tolerant to cocaine; from a dose of 1½ grains, where as little as 8 may be fatal, the dose may be increased easily within a month to 20 grains. But man in this regard is peculiar, for animals become more sensitive to regular periodical doses and not less.[1] It is thought that tolerance in this case is due to the same causes as in the case of morphine, viz. increased destruction, but this has never been shown. Time is an important element. "The daily dose is relatively unimportant, and it is far easier to cure a patient who has taken 20 grains of morphine a day for three months than one who has had only half a grain daily for ten years. The former can be rapidly cut down with comparative ease."[2] Cocaine tolerance is apparently less definite and slower in formation than morphine tolerance—several cases are on record in which 100 grains of cocaine were taken daily.[3]

One would have supposed that in the relief of pain some quantitative correlations would have been forthcoming, but we have to be content with broad statements, such as "this patient was given, after an operation for appendicitis, a dose of $\frac{1}{12}$ grain of heroin every night for five weeks. This led to the addiction habit. At first the heroin had a stimulating effect, and as this wore off the dose was increased."[4] The average heroin addict consumes 8 to 20 grains daily and

[1] W. E. Dixon, "Cocaine Addiction," *Brit. Journ. of Inebriety*, Jan. 1925.
[2] Margaret Vivian, "Drug Addiction," *Ibid.*, Jan. 1927.
[3] W. E. Dixon, "Drug Addiction," *ibid.*, April 1924.
[4] Sir Wm. Willcox, "Drug Addiction," *ibid.*, Jan. 1924.

attains considerable tolerance.[1] The caffeine beverages are said to " enable the subject to perform more work," and not to be true addiction drugs, because the doses cannot be much increased on account of cardiac symptoms.[2]

5. The Stimulus of Alcohol, Tea, etc.

I do not propose to haggle over words in using the term " stimulant " in this connection for alcohol. Modern scientific investigation seems to have established the fact that it cannot be regarded as a " stimulant " in the true sense, though it has that appearance subjectively, when by narcotising the higher co-ordinating nervous centres it removes the inhibitions on the lower centres and allows them to act with unusual lack of shyness and freedom from restraint.[3]

Some go so far as to call it a " purely narcotic drug, and not an excitant in any way," merely relieving states of tension, but others agree with Mr. W. E. Dixon of Cambridge that it has " some slight claim to the title of cardiac stimulant." [4] In connection with alcohol, therefore, I refer to this subjective effect of release as if it were true stimulus, for the objective consequences have that character, up to a point. And there is no reason to suppose that the laws governing reaction from artificial depression differ greatly from those applicable to artificial stimulus.

Most experimental tests of alcohol effects stop short at the first result, and establish no statistical relations with successive doses and effects or larger doses and effects, but merely give general ideas. Thus, on the power of alcohol to induce sleep: " At first it provides the desired effect . . . but the dosage has to be rapidly and continually increased." [5]

[1] W. E. Dixon, " Drug Addiction," *Brit. Journ. of Inebriety*, April 1924.
[2] C. J. Bond, *ibid.*, Oct. 1922. Also C. C. Weeks, *ibid.*, July 1925. Fr. Hercod, *ibid.*, Jan. 1926.
[3] *Vide* specially " Alcohol " (Medical Research Council), p. 149. Horsley and Sturge, " Alcohol and the Human Body." *Vide* also Dr. Bousfield, " Pathology of Alcoholism," *Brit. Journ. of Inebriety*, Jan. 1926, and Dr. Stanford Park, " Inebriety—Disease or Vice? " *ibid.*, April 1924.
[4] " Mental States in Alcoholism," *Brit. Journ. of Inebriety*, July 1921.
[5] Sir Maurice Craig, " Alcohol in Relation to Mental Disorder," *ibid.*, Oct. 1925.

Some degree of tolerance results from continual use—steady drinkers have been known to take daily 23 ounces of absolute alcohol—" more than enough to kill a neophyte." [1] But this tolerance is different in degree for nerve cells compared with other bodily cells. In any case it is far different in degree from that for other drugs, such as opium and morphine.

Even the precise personal experiments by Dr. Vernon have not thrown much light on the problem of continuous doses, though they indicate the progressive diminution of the effect of one dose. For example, from a percentage of 1·6 in typewriting errors before the dose, he got 9·8 per cent. 34 minutes after, 8·0 per cent. 94 minutes after and 5·7 per cent. 134 minutes after. The time taken for chain assembling rose from 382 seconds before alcohol to 455, 50 minutes, and 439, 80 minutes after.[2] Certain small indications of cumulative effects of six daily doses emerged.[3] Totterman showed that skill in threading needles the morning following a dose deteriorated perceptibly after 5 days and materially after 10 days, while 6 days' cessation were necessary to reacquire skill.[4] McDougall's experiments were also mostly of the same non-repetition type [5] and exhibited the strikingly opposite effects of *tea*. Contrast between alcoholic and other " stimulants " is made by Horsley and Sturge : " Tea, coffee and cocoa have no depressant after-effect. Their exhilarating influence has no reaction stage to follow, neither do they cause degeneration of the tissues—hence they are entitled to be called ' stimulants ' . . . alcohol has a prolonged depressant after-stage. . . ." [6] Sir F. S. Clouston said : " So far as scientific experiment goes, tea is proved not to weaken but rather to stimulate the mental power. Its use in moderate quantity is not followed by any injurious reactions." [7]

Sargant Florence tested the effect of tea upon typists given at 4.15 to 4.30 during afternoon work lasting from 2 till

[1] " Alcohol " (Medical Research Council), p. 99.
[2] *Brit. Journ. of Inebriety*, Jan. 1923.
[3] *Ibid.*, Jan. 1922.
[4] " Skand. Arch. f. Physiol," 1920, p. 107.
[5] *Brit. Journ. of Psychology*, Vol. 1.
[6] " Alcohol and the Human Body," p. 90.
[7] " Hygiene of Mind."

5.45. On tealess afternoons the last 1½ hours averaged 1·95 lines per minute, but on the others 2·61 lines—an increase of over 33 per cent. There is no record as to whether this advantage tailed off.[1] He records Martin's experiments with heavy and light smokers, but only that the hourly output curve of the heavier smokers falls off more markedly.

The careful records of the Medical Research Council do not throw much light on final reactions or repetitive effects, for they deal mostly with direct results of single doses, with vague references to effluxion of time, *e.g.* Miles also found that the speed of the knee jerk was lessened during the first 2¼ hours after a dose of 30 c.c. of alcohol—subsequently the speed was somewhat increased. Again, 40 minutes after a dose the speed of the eye-closing reflex was decreased by more than 12 per cent., the speed gradually increased till 2¼ hours after the dose it was somewhat greater than normal—it then became less.[2]

The Council records Hellster's ergographic experiments: a decrease in recorded muscular work of 20 per cent. half an hour after the dose, 17 per cent. 1 hour and 11 per cent. 2 hours after.[3]

A suggestion of *full reaction stimulus* is indicated for alcohol by Dr. Collis.[4] In withstanding fatigue "a dose may cause a slight and brief immediate improvement which is usually followed by marked decrease in work accomplished"—in one case 12 per cent. Hellster's ergographic records also showed exact measures of this reaction.

An example of "*special achievement*" by alcohol stimulus is given by Dr. Bedford Pierce:

> "I may here recall a personal experience as illustrating Dutch courage. Once when mountaineering, after an injury to an arm, I ascended without great difficulty an ice-slope in which the guide had cut steps of ample size. On the return journey, however, when exhausted after a long day on snow and rocks, I dared not attempt the ice-wall, and felt I could not possibly lead down it, although the steps were as large as coal scuttles! At that juncture the guide pulled out his flask and I drank the spirits offered.

[1] "Economics of Fatigue and Unrest," p. 263.
[2] "Alcohol," p. 49.
[3] *Ibid.*, p. 53.
[4] *Brit. Journ. of Inebriety*, July 1922.

Immediately my mood changed. I had forgotten nothing; it was not a case of oblivion; and I grasped the risks quite clearly; but all nervousness had left me: I knew that I should not slip! In ten minutes the descent was accomplished, though later, at the hut, I was obliged to lie down for an hour, and when I started again I felt unsafe on the ordinary mule track!"

It will be seen, therefore, that the leading from the physiological action of stimulants is very inconclusive in the direction of a generalised principle which can assist us, though analogies may be interesting.

6. The Fertiliser Stimulus

In the case of fertilisers we may have to complicate the simpler ideas of stimulus. For it may be a new chemical element added to the others, and subject to straightforward usage of the added stock in a quantitative sense; it may be a "release" setting the other elements to work; or an energiser toning up the whole combination of elements for their task.

Sir Daniel Hall writes:

"Fertilisers are in some sort conveyors of energy to the plant—at least they make it able to draw upon the unlimited energy of the light reaching the plant. There is no exhaustion consequent on fertiliser action, nothing to suggest that the soil is less fitted to bear a second big crop after the first has been brought about by ample fertiliser."

The results of field tests, which I quote below, are "probably due to other factors than exhaustion consequent on fertiliser action. One is possibly the depressing effect of a given crop on successive crops of the same kind—a very real effect with clover, a probable effect with barley, but small and hardly distinguishable with wheat. The second factor is the accumulation of weeds on these plots, which are set to grow the same crop year after year. Certain weeds which the crop favours become almost unmanageable in time, and I doubt if any of the Rothamsted continuous plots, after the first thirty years, have given returns that may be regarded as the 'absolute' equivalent of the fertiliser." The comparative results only bear discussion.

Experiments in wheat (Broadbalk Field), Rothamsted,

showed that, under the annual application of a constant amount of farmyard manure (14 tons) for sixty-one years, " after a rapid rise during the first eight years of the experiment, when the land was recovering from a state of comparative exhaustion, the yield has been slowly increasing." On the unmanured plot there was at first a fall, and then it became practically constant. The treated soil had accumulated reserves of plant food which it would take over fifty years to " crop out " entirely. The other fertilisers in annual application seemed, broadly speaking, to have big initial effects with a slight tailing off later into a relatively constant level.

Barley crops in Hoos Field showed a continual decline without manure and not a comparatively stable position, while the continually dunged plot has not maintained its yield, but has slowly declined. These results indicated that no positive law of exhaustion from successive stimuli can be found in this direction, and merely that the barley crop is far more dependent than wheat upon a supply of manure and particular manures. Mangolds, turnips, potatoes and sugar beet fail to yield any common generalisation. In the case of beans and hay the deterioration in yield for unmanured and manured lands alike was very marked. The plot 7–1 shows the residual effects of dunging twenty years from 1852 to 1871. One table gives the five-year average yields as percentages of the average yield of the continuously manured plot (7–2) sinking from 75 (1872 to 1875) to 40 (1907 to 1911). Plot 10, which has never been manured, sinks from 25 to 20 per cent. Although the " crop grown with residues of dung is continually falling, it will only reach the level of that on the continuously unmanured plot after a long time." [1] But the effect of potash upon the yields was seriously diminishing or practically constant, according to

[1] On this Sir Daniel Hall remarks : " The case of dung showing its effect for twenty years and over can most simply be regarded as a case of slow exhaustion of an initial stock which only becomes liquid by degrees. The best analogy is that of the edition, say, 2000 of a standard book. In the first season perhaps 1000 are sold, next year perhaps 300, less and less each year as the book ages, till in time it is dribbling out at about twenty copies a year, a little up or a little down as some favouring wind does or does not blow."

whether ammonium salt or nitrate of soda was the source of the nitrogen used.

Certain experiments with " doses " of fertiliser, two, three and fourfold, showed wheat yields obeying the law of diminishing returns, 18·3, 28·6, 37·1, 39 and 39·5, or increases of 10·3, 8·5, 1·9 and 0·5, while the straw results were not dissimilar.

Sir Daniel Hall's summary of my review above is informing :

" You can regard an imperfect fertiliser as a stimulant—*e.g.* nitrate of soda contains N alone, and will provoke considerable growth, with a consequently extra draft on the stock of phosphoric acid and potash in the soil. Hence with an imperfect fertiliser, by provoking growth that draws from the soil things which are not put back, the yield after a time *might* become less than with no fertiliser at all. I stress *might* because only in one case can I trace this to have happened at Rothamsted. Generally some secondary reactions set in. Successive doses of fertiliser do result in increments of descending magnitude (law of diminishing returns). Several other cases have been worked out since the one from Rothamsted that I published. Possibly, however, the curve of increasing production is a sigmoid curve concave at first before it turns over, like Yule's population curve ; but I don't think the data available are accurate enough to determine this."

7. The Mechanical Field

In the field of *metal stress* there appear to be no real experimental conclusions or laws defining what may result from a variation, say, of heat treatment in enabling an increased stress over the normal to be withstood, either (*a*) with continued extra power during the rest of its life, or (*b*) with a reduced or normal stress afterwards to secure normal life, or (*c*) with a subnormal stress afterwards to secure an ordinary life.[1]

8. Stimulus in the Physiology and Psychology of Labour Tasks

There is a considerable field of inquiry which is of direct economic significance exhaustively covered by Mr. Sargant

[1] *Vide Proceedings of Institute of Mechanical Engineers*, 1922, Sir Henry Fowler, for differences in tensile tests.

Florence in his " Economics of Fatigue and Unrest," which records many exact statistical results of variations in working conditions, of the " before " and " after " type, taken in two blocks, and generally without a succession of the effects which would enable one to see whether the improvement is constant, or increasing, or diminishing. A careful study of the field leaves one with the impression, however, that all those differential points which are in the nature of improved conditions of work, *i.e.* increase its *" feasibility "* as the author puts it, act just like an improved tool or new invention would do, and give a constant increment to production.

Belonging to this order of improved conditions I may mention optimum points of temperature, ventilation and of humidity, especially in certain industrial processes; arrangement of spells of continuous work, giving maximum production, minimum fatigue, minimum accident rates, minimum defective work; comparisons of days and night work with similar objects; the accident curve of consecutive hours of work; the effects of overtime differently arranged; motion studies involving a rearrangement of manual movements. Experimental tests may show, too, the optimum load—thus Taylor found that when pig-iron loads were 92 lb., a first-class workman could only be under load 43 per cent. of his time, and reducing the load improved the percentage, so that the output was increased as much as 276 per cent.

These cases are what I have called " increased scope " rather than any change in incentive or stimulus, and if they fall within my subject at all, they do so only as regards the *stimulus* to discover such short cuts, or improved methods, or physiological reactions. This stimulus may spring from scientific curiosity, in the psychologist; from economic interest, in the effects upon production; from humanitarian motives, in a desire to minimise fatigue, ill-health or monotony.

When Sargant Florence is discussing the scope of fatigue and unrest and its graduations from positive ill will at one end to ill-health in occupational disease, he likens them

to a spectrum in their shading off, a " notion of a kaleidoscope of moods and conditions . . . facilitating a solution of what may be called the variations in the stimulus imbroglio." He notes that variability of stimulus has given rise to trouble to the student unnecessarily because of its use for two distinct types : (*a*) variations in *external* incentive, such as payment of a higher or lower piece rate or the approach of holidays, and (*b*) variation in the shade of capacity or willingness, *i.e.* in the inward stimulus or intensity with which the human being is working, variations which may or may not be the result of variations in some external stimulus.

The effects of a change of hours upon the economic output are less mechanical and physical, and more physiological and psychological, because the economic motive is more directly affected. Sargant Florence sums up a long examination of available material by declaring : " Reduction from a 12-hour to a 10-hour basis results in increased daily output ; further reduction to an 8-hour basis results in at least maintaining this increased daily output ; but further reduction, while increasing the hourly rate of output, seems to decrease the total daily output. These results were obtained mainly in the type of work where the speed of operation depends fairly equally on the human and the mechanical factors. Probably where machinery predominates in setting the pace a reduction of hours would result in less rise or greater fall in output." It must not be forgotten that the final improvement in net output is a combination of better output per hour, less absenteeism, lower accident rates and less defective output. When hours are reduced the improvement is not immediate, for there is an interval of adaptation, but in the reverse case, where hours are lengthened, experiment showed the decrease in hourly output is practically immediate. Vernon found that a change from 6- to 8-hour shifts put the hourly output down by 11 to 14 per cent.— practically to the old figure.

None of the statistical records throws any doubt upon any improvement of output through reduction of hours being steadily maintained, but they do show that successive

equal " doses " of reduction tend to have a clearly diminishing effect. But here one has to consider nominal reductions of hours in contrast with actual reduction. It sometimes happens that a *decrease in nominal hours* results in an increase in actual hours of work (Florence, p. 208). We have moved a long way from the time of Senior, when lopping off an hour from 11½ hours' labour was matched with lopping off the whole net profit, owing to the great proportion of fixed to circulating capital. Physiologists have claimed that the worker, consciously or otherwise, maintains an equilibrium in energy by balancing application against length of his working day.[1] If 12 hours have to be worked instead of 10, closeness of application will be less throughout the whole, and Vernon suggests an unconscious balancing of pressure to account for the astonishingly steady output of workers in heavy operations.

Sargant Florence, in summarising the effects of piecework rates as compared with time rates, says that they do not afford the proper " incentive " unless certain simple conditions are fulfilled: (*a*) the worker's output must be individually clear, and not confused with that of others, (*b*) the system must be clear, and non-proportional rates of increase must not be too involved, (*c*) the worker must not have reason to suppose that his output is being measured for any other purpose—*e.g.* rate cutting, which has so often led to restriction of output. The effect of introducing piece rates has often been statistically demonstrated. The British Health of Munition Workers' Committee, for example, showed that girls on day shift increased output 24 per cent.; on night shift 40 per cent.; in the particular case of re-tapping fuses the increases were 28 and 48 per cent. respectively.

But a combination of time and piece rates has failed to provide such incentive. Vernon (" Industrial Fatigue and Efficiency," p. 133) showed that riveters with a guaranteed daily minimum had restricted output to a point which at piece rates gave less than 60 per cent. of their minimum

[1] Kent, " Second Report on Investigation of Industrial Fatigue by Physiological Methods."

pay. When the daily minimum was abolished they nearly doubled their output of rivets.

Florence gives as an " anti-incentive " the fixing of piece rates too high by reference to actual study of the *best* worker or the *best time* of an average worker. There is such a considerable variation natural to men that the error of scientific management in relying on a standard time or standard performance with 80 or 150 per cent. efficiency is rightly criticised. He mentions as a curious stimulus piece-rate earnings prior to a holiday, which puzzle those who are studying fatigue, and must be due to the desire to accumulate a fund for spending. In general the value of " interesting " the worker in the process of production by education, etc., has been often proved, but no statistical correlations are available, because the degree of interest cannot be quantified.

" If the daily output distribution in any operation has a relatively wide dispersion after an efficiency system of wage payment is introduced, this would indicate success in increasing incentive and stimulating the departure of individuals from a common dead level " (Florence, p. 224). Narrow dispersions, skewed negatively, signify deliberate human restriction of output. Skewed positively, after the introduction of selection of employees by test or examination, a narrow dispersion indicates a successful system of selection.

Florence quotes Knoeppel with approval, in discussing the incentive of piece wages. " Each man should see an ideal ahead of him that his mentality can readily comprehend, for just as surely as he attains this ideal, it is automatically replaced by one still higher. Thus standardisation becomes not crystallisation, but evolution." It is very doubtful, however, whether, as a rule, this is true. Just as there is an equilibrium of effort and hours, so there may often be one between effort and standard of living. It has often been remarked that certain classes of workers who can reach their standard with a few days will be absentees on Mondays or other days. Lord Rhondda, speaking of coalminers, said :

" The better-off men were, the more easily they could obtain the means of subsistence, the less energy they put forward; there was a very considerable diminution in the output per man per annum. On the other hand, when prices fell and wages followed, the fact that the men worked harder accentuated the depression which followed. . . ." [1]

I remember seeing graphs in 1919 and 1920 which showed that although increases in wages had been given, the men did not take full advantage of the increased earning power, and other weekly statistics throughout 1921 showing that the reverse process is also true, viz. that when reductions in wages have been made there is no corresponding reduction in hourly earnings. General experience has frequently verified the former on broad lines, pointing to a *standard amount* of total earnings, which the worker will exert himself greatly to reach, and will not exert himself greatly to exceed.

In physiology, specific antagonisms have been studied by Sherrington as " reciprocal inhibitions " of reflexes. An excitation by stimulus of one set of muscles is accompanied by a corresponding relaxation of others. This phenomenon has its mental counterparts especially in visual phenomena and attention.[2] In psychology, Spearman says " mental competition " with the law of constant output is well vouched by evidence. " The commencement of any mental activity causes other activity to cease," and *vice versa*. For the law of constant output is thus stated : Every mind tends to keep its total simultaneous output constant in quantity, however varying in quality.

9. Experimental Psychology

In the field of experimental psychology and measurement of intelligence by correlatives, mental reactions to different stimuli have been measured to some extent, but seldom for reactions to successive applications. Schäfer's experimental subjects, while memorising a sense of colours, were startled by a pistol being fired behind them. A large and

[1] *Statistical Journal*, 1914, p. 174.
[2] Spearman, " Abilities of Man."

measurable loss of memory ensued. With repetition the emotional effect decreased and also the disturbance of memory. Dancing mice learned to select the right opening to secure food, and avoid an electric shock, but they learned it more quickly when the shock was slight, for " though all pain from the shock increases the volition to select the other outlet, yet an excess of pain neutralises this advantage." [1]

What the psychologists call " perseveration " has been made to include the following subjects of direct experiment: (*a*) persistence of after effects, *i.e.* the continuance of physiological and psychical impression beyond the real duration of the external stimulation; (*b*) spontaneous recurrence to consciousness of an experience, without fresh stimulation; (*c*) degree of hindrance which the perseverating effect of past mental activity causes to a new one of the same kind.[2]

Some experiments have shown that, even after lifelong practice, with a sufficient motive, people have surpassed what they had previously regarded as their ultimate physiological limit. Thus four experienced type-setters made a continual series of improvements for the first quarter of an hour of each day. Spearman says:

" Unfortunately the possible grounds for such improvement are so complex as almost to defy reliable analysis. Not improbably, the most potent factor consisted merely in the overcoming of a deeply rooted *habit*—that of working at a rate which could be maintained with comfort and accuracy for the whole day. Such evidence is far from being decisive in any direction." [3]

Experimental variations of incentive with children have led to very negative conclusions.[4] *Very* great effort—such as is produced by a prize of money—tends only to increase speed at the expense of accuracy.[5] It has some analogy with the bad effect of " pressing " in games of dexterity. Different thinkers vary in their experience as to whether a mental problem of special difficulty is best mastered by

[1] Spearman, " Abilities of Man," p. 105. [2] *Ibid.*, p. 298.
[3] *Ibid*," p. 333. [4] *Ibid.*, p. 333. [5] *Ibid.*, p. 334.

means of intense exertion, or whether this militates against success. A class of students were evenly divided upon it. One is reminded of the two opposite modes of thought adopted by Spencer and Mill, and described in their respective autobiographies.[1] Graham Wallas comments on Mill's method of repeating by voluntary effort a high degree of energy until it became partially automatic as a habit. "We can detect in the two statements the chief causes which made Mill's thought, though done by a tired man after or before office hours, more valuable than Spencer's thought, though he gave his whole time to it." [2]

The importance of stimulus to effort, as against a merely passive attitude, has been experimentally proved by psychologists. Nonsense syllable series were learned in one case with 13 and 9 repetitions as against 89 and 100 required otherwise, and subsequent retention was also much greater in the former case. Habit requires more than mere mechanisation—it demands set purpose and persistence in effort. In the case of telegraph operators, the rise in the "attainment curve" only took place when there was a deliberate attempt to improve, due to strong stimulus, such as desire to secure extra pay.[3] The neural basis of habit is well established. Actual formula for attainment curves have been found and applied. Fox's curve is :

$$t = \frac{k}{(n+p)\,c} + T,$$

where t = time necessary for a single operation, n the number of the performance, k, p and T are constants for subject's capacity, etc.

My survey of what we know about the reactions to stimulus in different fields of scientific inquiry in a quantitative sense indicates that the extent of precise measurement has been very scanty, and no generalisations are yet possible. But so far as classification is concerned, illustrations can

[1] Spencer, "Autobiography," 1. 399–401. Mill, "Autobiography," p. 123.
[2] "Art of Thought," p. 155.
[3] Fox, "Educational Psychology," p. 118.

be found in general terms for every type that I first set out as hypothetically possible. We can carry over into the economic field no single type or line of thought, and it behoves us, therefore, without vague preconceived notions drawn from doses and drugs, to scrutinise every case of economic stimulus to ascertain its true character, warned by the variety of the findings in the constituent physical, physiological and psychological elements, that we must expect wide differences and vital distinctions. It may certainly be said that we have definite teaching in the psychological experimental field to suggest valuable and positive lines of advance in those economic reactions which follow from stimulus to acquire mental skill, knowledge and improved ideas.

10. Economic Stimuli

(*a*) *Rising Prices.*—It is now well known that inflation is an important stimulus to business enterprise, because the equilibrium of division of the product of industry is deranged at least temporarily in favour of the business owner, especially if he is working upon loan capital. Suppose that in a static condition a business man produces 10,000 product units worth 10,000 money units, and pays away the equivalent of 1000 product units to the supplier of raw material, in 1000 money units, 5000 to labour, 3000 to the lender of capital and retains 1000 as his own profit. Now let the money units be multiplied so that the price level rises 50 per cent., and a product unit is worth $1\frac{1}{2}$ money units. Then he receives 15,000 money units for his sales of 10,000 product units, pays away 1500 money units for raw material (equivalent to 1000 product units as before), but for wages he pays the old 5000 money units (now worth only 3334 product units) and to capital 3000 money units (worth 2000 product units), and retains for himself 5500 money units equivalent to 3666 product units. Wage adjustments may soon take place, but perhaps not to the full extent, and old invested capital may be tied to him to its permanent disadvantage. His profit is so good that he is stimulated to expand his business at a somewhat

reduced price in money units. This can go on so long as the stimulus is received in continually increasing doses. But on its cessation, or still more on its reversal, the reaction is severe. Just as his gains were fortuitously increased by the lag before, now they are diminished or wiped out by the lag in reducing nominal wages. The phenomenon ought, after the past twelve years, to be understood by everyone, but it is still too little realised what disaster a reduction in price level, where other elements are not readily mobile, can work in the economic community.

Now, with considerable breaks, a secular change has been going on in the value of money during the past five hundred years, in such wise that business enterprise has continually, but unconsciously, been subsidised by the slow, unseen robbery of past accumulations of capital, little felt because so gradual, and because ownership has passed through many generations. A man in the sixteenth century who abstained from consuming 100 units worth £100 in order to enjoy £6 or £7, buying 6 or 7 units, per annum, has been succeeded in ownership by a descendant who may get the same £6 or £7, but it may now buy only half a unit, owing to the continual depreciation of the monetary unit. These twilight death duties have always hit the owner in possession. As a matter of fact, of course, no such continuous ownership of mere monetary titles has existed, because redemption reversions and terminations of one kind and another have affected probably every individual case. But the secular stimulus has been a fact all the same.

(*b*) *Changes in Demand.*—The literature of economics on fluctuations abounds in the use of the words "stimulus" and "stimulate" and their synonyms or variants. Thus: "Demand for a product being elastic, a rise in its real costs stimulates a curtailment of output on the part of other industries, and . . . the demand for a product being inelastic, a fall in its real costs stimulates a contraction, and a rise in its real costs stimulates an expansion of output on the part of other industries." [1] Here the word shades in meaning from "tends to promote" up to "necessitates,"

[1] Robertson, "Banking Policy and the Price Level."

according to the degree of friction postulated. It is very much as if one said: "Let three balls of different weights or sizes be resting on the bottom of a bowl—the removal of one of them will *stimulate* a change in the position of the other two."

(*c*) *Taxation.*—I do not pretend that the distinction between the two meanings of stimulus is always clearly marked, and often both are present, for the enlarged scope itself may give zest to a jaded incentive. A good example is the *stimulus* given to saving by a substantial relief in supertax. A man with £10,000 a year has been spending, say, £6000, saving £1500 and paying £2500 in tax. Now his tax is reduced, say, to £1000. There is an impetus to saving because the fund available for saving with the same incentive per £ of saving has increased from £1000 to £3000. But the net reward for savings, due to the lighter tax on the income to be derived and the larger sum to be retained, means that each £1 is much more worth saving. Both scope and incentive are increased, so that there is a stimulus to saving in both senses.

11. Classification of Economic Stimuli by Results

Throughout the literature of the inquiry into industrial fluctuations, the successful upshot of which means so much to the future of civilisation, the ideas of automatic scope and motival impetus are confused under the one set of terms. Again, even where the terms "stimulus" and "stimulant" are confined to the latter sense, they are used to cover two influences of highly different consequences. It is natural to rejoice when some factor improves business. But if it is a factor that inevitably entails a reaction, even an equivalent loss, how different it is from a factor which will permanently raise economic life. What we really want to know of any encouraging stimulus is its ultimate effect as class A or class B or class C.

For example, let me take one quotation from Professor Pigou's latest book, "Industrial Fluctuations," p. 102, where he is dealing with the relative demand for instru-

mental and consumption goods. "Thus, the upward fluctuation of industrial activity above the normal *carries with it* a subsequent downward fluctuation below the normal when the stimulus is removed, and not merely a subsequent return to the normal." In other words, a perfect illustration of stimulus Class B 2 "*Status quo*—full reaction."

How can we go on accepting with uncritical satisfaction every factor that makes for better business as though they were all alike, when some bring their own nemesis? Or with indiscriminate depression every factor that makes for bad trade, when some are generating their own reaction?

On a broad view, I should say that the monetary factors in fluctuation, however stimulating, are nearly all of the self-reaction type, and what one gains on the swings to-day is lost on the roundabouts to-morrow. If they are very severe they belong also to type "C," and actually lower the tone of industry. Thus, with labour suspicious of capital, a perfectly justifiable attempt to adjust money wages downwards to secure that real wages do not advance too fast for total production may bring about prolonged labour disputes and exasperation, with ca'-canny and other anti-economic policies for output in the future, when the crisis need never have taken place at all if monetary fluctuations had been kept within narrower bounds. On a broad view, again, I should say that psychological causes of industrial fluctuations, including mass miscalculation of production and demand, tend to be of the B 2 type, varying towards C 2.

But the stimulus of a bountiful harvest, with the enhanced purchasing power it may afford, tends to be of the simple B 1 type (*status quo*—single gain). On the other hand, a clever reduction of costs through reorganisation, or a definitely better motive stimulus to work harder or more efficiently, belongs to the A 1 class.

But these are only broad generalisations, and we need some running scientific analysis in popular thought upon economic life in general to create a technique of discrimination.

12. The Value of Rhythm

It must not be supposed that the elimination of the monetary factors in trade fluctuations would produce an absolutely level and predictable course of business, in which the only reason for good or ill fortune by individuals would be the competition of their varying individual merits or the differences in their physical equipment. In the first place, price-level control by banking policy could never be exactly effective, and its minor errors of judgment must inevitably set up irregular movements with a definite, if more limited, range of fluctuation. Secondly, those naturally variable or unpredictable phenomena, such as aggregate world harvests, the content and life of mineral properties and the vagaries of human fashions, must always provide elements of uncertainty giving periodical jerks to an otherwise even progress of events. In the third place, as D. H. Robertson points out,[1] an alteration in the operating costs of one industrial group may indicate a situation in which other industries have a reason to expand (or contract) their output. "In particular, a lowering of the cost of production of basic constructional materials may constitute a natural incentive to the expansion of output on the part of pretty nearly every trade." His general conclusion is that "even in the simplified industrial world which we have constructed we should not expect the appropriate or optimum rate of industrial output to be constant, but to be subject to a succession of what may be called 'justifiable' increases and decreases, some at least of which are of a fairly rhythmical nature."

So far as concerns agriculture—an industry which is clearly a basic element in economic activity—all efforts to reduce its records to a rhythmic rule have so far been baffled. Sir Wm. Beveridge's great attempt at establishing various overlapping harmonic series is said by some mathematicians to be little different from results which might be obtained by harmonic analysis from a random series of numbers. But if all other natural elements in

[1] "Banking Policy and the Price Level," p. 16.

economics were entirely static, it is probable that the human element is in itself rhythmic.

Small fluctuations may belong to a larger system, which includes others of longer duration. Steady pulsations in mental output, like temperature from moment to moment, go on irrespective of larger and seasonal changes.[1] These oscillations tend to have such constancy or stability as to be rhythmic, finding an ultimate physiological basis.[2]

Is it very likely, however, that a quality essential to the individual will have cumulative effects in the mass in large numbers? It would rather be expected that the " heights " of one-half would coincide in point of time with the " depths " of the other half of the workers, and make for stability in the mass, or that individual differences are like that dashing and colliding in all directions by which " solidity " results from the perpetual motion of atoms.

The question whether in the long run the economic advance to be secured under conditions of stability or rhythmic and predictable fluctuation will be greater than under those of more violent and incalculable change, probably resolves itself into a contrast between the advantages of a perfect development of existing economic institutions and the advantages of radical improvements and increments of revolutionary change from the gross value of which have to be deducted the losses and disadvantages of disturbance and destruction in human and physical or invested capital. Thus, if a manufacturer were quite sure of his market and ran no risks of obsolescence, he would devote himself, without danger to his capital, to investment in quite small benefits of reorganisation and oncost adjustment, and he would bring the productivity of existing methods and machinery to a high pitch of perfection. But if he is never certain that a new process and deranged demand may not upset his calculations, it is worth while risking capital only upon large marginal gains, and such are provided by great changes which increase gross product

[1] Spearman, " Abilities of Man," p. 321.
[2] Bayliss, " Principles of General Physiology." Fox, " Educational Psychology," Chs. X and XII.

in a striking degree. But obsolete plant has to be amortised and displaced human skill has to be supported and transferred, so that large deductions must be made from such gains before the net progress is ascertainable or comparable.

For cycling as an interesting and pleasurable pastime maximum advantages were not, in the long run, gained upon absolutely level surfaces, exhilarating as an initial burst of speed may have been. Neither would one for long find pleasure in a road with alternating rise and fall of identical extent and scenic sameness. Nor was a series of breakneck descents and unrideable ascents conducive to a successful tour. A mixture of compassable difficulties and balancing ease, of surprise and variety, but all within the compass of safety and of the limits of rest and refreshment which are normal to man, provided the optimum satisfaction. So with economic progress serving human happiness. But Hamlet's " How weary, stale, flat and unprofitable seem to me all the uses of this world " anticipates my association of flat cycling and economic profits. Too violent or rapid change may stretch the elasticity of the fabric beyond its critical point, so that it may fail even to rebound or react. It may deprive the medium of its essential tone or quality, like an overweighted spring or an overstretched elastic. Within a critical point rebound is certain, and the nearer the critical point the more rapid, but beyond it is disrepair, with perhaps a slow recovery of tone. Something of this order of stress has come upon some basic British industries as a result of the extraordinary violence of economic change since the war. As Professor Whitehead says, " There is a degree of instability which is inconsistent with civilisation. But, on the whole, the great ages have been unstable ages." [1]

The object of controlling monetary policy and the price level is not really to flatten out economic life into a dead level, but to ensure appropriate and ready reaction to changes in output, and to act as a governor so that those changes shall not be cumulative and amplified, and especially that they shall not pass beyond the critical or test point,

[1] " Science and the Modern World," p. 259.

beyond which the swing is not back to equilibrium, but goes on to complete overturn. This, moreover, is quite a different policy from that advocated by those who would continually create purchasing power, and *in advance* of production, as an artificial lure which could be indefinitely repeated without disadvantageous reaction, a continual goad to the price level, a perpetual promise of greater real gains than can ever mature. But the economic donkey with his nose a fixed distance from the economic carrot tends either to overrun his strength or discover the illusion.

It is impossible to be dogmatic about a higher rate of wage being a stimulus to the whole organism, without studying the conditions. If it makes possible a physical condition in the worker which creates an ampler output from which the wage can be derived, and is in the first instance a bridge of hope, then obviously it is an all-round betterment. If it deranges the rewards of other factors of production, it may well defeat its own object. Even, in itself, it does not always make for a higher total wage, but only or partly for less work time. If leisure is wisely spent, even the latter may be economic gain, but it is not a postulate that is often safely made.

That a given real reward is, in any absolute sense, requisite to call forth a given effort of body or mind is manifestly fallacious. Men quite happily worked just as hard for half the real income two generations ago. They obviously work just as hard for half the real reward in one country compared with another at the same moment. The standard of life, and the living wage, the motive of adequate profit, are all relative conceptions, governed by comparisons in juxtaposition for time and space. The bearing of this on heavy taxation is obvious. It " depresses production," and so on. But even the net real reward, after bearing the dreadful burden, is far greater than it used to be in days of lighter taxation.

Immediate changes of taxation may be potent, but tolerance both ways is extraordinary. The usual budgetary season assurances make out that if the Chancellor would only take a shilling off the income-tax he would so stimulate

trade as to more than make good the loss in the rate by the volume of the assessment. I have shown elsewhere that, with maximum postulates, the real effect is unlikely to exceed a recovery of 2*d.* in the £, instead of the whole 1*s.* in the first instance. In later years increased scope will make the effect cumulatively greater, but this is probably offset by the deadly effect of either tolerance or exhaustion in toning down stimulus.

13. Discrimination and Stimulus

It is time to consider briefly the positive stimuli of the A 1, or Full Permanent Gain, class, upon which economic progress really depends. The first is any stimulus to overcome the conscious effort of a new or difficult way of working, physical or mental. Fortunately, repetitive stimulus has the characteristic of setting up habit. William James said an effort repeated thirty times became a habit, and habit, said the Duke of Wellington, is not second nature, but ten times nature. James calls habit the "enormous fly-wheel of society, its most precious conservative agent." [1] May I say also that it is its most revolutionary agent? For men may reach a pitch of performance in one effort, and have no permanent effect on progress, but let them repeat it to the point of habit, and it becomes a new level of regular economic performance. Now it is not merely the stimulus Class B that would otherwise sink back to normal if not repeated, but also stimulus Class C, with its positive reaction, that may bring about a permanently higher level by repetition at sufficiently frequent intervals before the reactions have set in. Thus James says that without repetition, "it works so as positively to hinder future resolutions and emotions from taking the normal path of discharge." In the realm of general thought and average mental ability the repetition stimulus is most important, and the distribution of repetition is equally important. Thus matter read five times in one day compared with once every day for five days gave almost equal

[1] *Psychology*, 1893, pp. 142–150.

results in memory the following day, but after two weeks' interval retention was 13 per cent. in the one case against 37 in the other, and after a month 11·5 per cent. against 30·5 per cent. in favour of the daily exercise.[1] The stimulus of an intelligible meaning to the matter learnt makes repetition remarkably economical and greatly lowers the number of times it is necessary to re-read. Sixty words were learnt with 6 repetitions and 750 with 19, where 36 non-related words took 55 and 33 repetitions for two practised learners.[2] The whole field of experimental educational psychology abounds in instances of the scientific study of repeated stimulus in permanently raising mental power. The contrast between small injections at frequent intervals, and those larger ones where reaction has time to set in has never been generally worked out. But medical men, finding that large-scale daily deep-seated injections for diabetes were causing wide fluctuations of pituitary activity above and below normal, have substituted frequently repeated insufflations which have kept the activity relatively level and above normal, enabling the treatment to be stopped altogether for some months.

In the higher field of conscious creative thought, which is the line of greatest promise for the progress of the world, the laws of stimulus and its application on lines of permanent advantage are only just beginning to be understood. " The education of the will by forming stable habits of action in new directions is a creative act in that it implants in the individual life new sources of energetic impulse." [3] Graham Wallas has well analysed both the value of habit and its snares. First comes the permanent power derived from a repeated time stimulus, starting intellectual work at a particular hour daily, so that " warming up " occurs rather more easily and quickly. Second, there is the value of particular sensory stimuli, such as furniture and ornaments arranged in a certain order. As against this, too set a habit in point of time may deaden

[1] S. D. Austin, *American Journal of Psychology*, 1921.
[2] D. D. Lyon, *Journal of Educational Psychology*, 1914.
[3] Fox, " Educational Psychology," p. 111.

really creative thought. "Every thinker must remember always that if he is to get any advantage from the fact that he is a living organism, and not a machine, he must be the master and not the slave of his habits. He may find it best to sacrifice some of the advantages of habit in order to strengthen the factor of stimulus by beginning work at dawn and going for a walk at 11 a.m." [1] Descartes "got the most fruitful stimulus of his life by going on a short campaign. This antinomy between the stimulus of habit in time and place and circumstance, and the stimulus of breaking habit, is constantly reflected in the lives of those who are capable of serving mankind as creative thinkers." It does not follow that the habit-breaker must in itself be a highly significant incident. "Almost any idea which jogs you out of your current abstractions may be better than nothing." [2]

Graham Wallas is full of suggestive reflections upon the increase of mental energy. He says wisely that, in the art of thought, as in other arts, the efficient stimulation of energy does not depend merely or even mainly on either the intensity or the repetition of the original effort. The thinker must also learn how to make that particular kind of effort, that particular "stroke," which will bring the energy of his organism most easily and most completely to bear on his task. "Natural thinkers, like natural cricketers, may learn it for themselves." [3]

Discussing Dr. Adrian's views upon the connection between physiology and mental energy, Graham Wallas says:

"There may be those now living who will succeed in relating our inexact and empirical observations of the effects of emotion and habit and action on the success of our thinking, to those measurable facts as to the energy of the nerve cell. If that happens, the art of thought may be helped and extended by knowledge of such things as the conditions of cell nutrition and the influence on living tissues of stimulation by sunlight or glandular secretions."

[1] "Art of Thought," p. 148.
[2] Whitehead, "Science and the Modern World," p. 77.
[3] "Art of Thought," p. 153.

I do not wish to embark upon the question of heredity in facilitating the formation of habit. But in the case of the experiments with mice to which I have already referred Pavlov found for the succeeding generations 300, 100, 30, 10 and 5 repetitions adequate for the formation of well-established habits of response. As Fox has remarked, " The case for the inheritance of acquired characteristics is not so desperate as some biologists suppose." [1] Certainly if it be added to the progressive development of successive environments, the outlook is a good one.

Necessity may be the mother of invention, but in her poverty she can afford very few children, and birth control is a real corollary.

Times of depression are indeed a forcing ground for reorganisation and the elimination of non-essentials, but apart from small ingenuities, in a time of abundance of resources alone can large-scale inventions and improvements be undertaken. We may then declare that Prosperity, not Necessity, is the mother of invention. In the United States to-day every kind of invention or improvement can be lavishly employed, even though only a small percentage comes to final fruition, whereas in a poorer country only those changes of proved worth, of large marginal improvements and of moderate cost can be undertaken. " To him that hath shall be given." The extent to which such prosperity will bring its own reaction in luxury, weakening the fibres of enterprise and application, must depend greatly upon the moral calibre of a people.

When one realises that a remote thought, seized by immense effort and brought into the light of full consciousness and experiment by a single thinker, may raise the standard of life of millions to a greater extent than the discovery of a new mineral field, or the acquired skill of a multitude, can do, one sees that the development of an art of consciously stimulating creative thought on best lines may be the greatest impulse to economic life.

The consideration of creative thought and of invention leads me to say that the stimulus of body or mind which

[1] " Educational Psychology," p. 34.

brings with it the severest reactions is nevertheless not necessarily unworthy or valueless. It may be of the highest service. Granted even that the " rum ration " succeeds its period of exhilaration by an equal period of depression, if the job in hand is the vital one of " going over the top "—a job of definite and vital significance and success—who minds what the aftermath may be? I quoted, when dealing with *Alcohol*, an example of what I have termed " *special achievement* " by alcohol stimulus. The parallel is equally found in every type of energy stimulus, but its value lies in its rarity and freedom from abuse, its reservation to the truly critical and supreme necessity. If on reaching the apex of the stimulus curve, lifted to that height, a glimpse is caught of an undiscovered world, an unsuspected truth or fact, who minds the B 2 curve of full reaction? If a man by intense and dangerous stimulation of physical and mental powers can break into a new field of human possibility, and reveal it to the world, is he likely to make nice calculations of the prostration of the morrow? Everyone must have had periods in his life when a spurt was worth, in its results, any possible personal consequences, when he might do for the super-normal what he would never attempt daily for the normal. Even the lethargic, who can see a great opportunity, and, when it is seen, rise to it with unstinted power, may be one of the world's greatest benefactors. It is otherwise, indeed, where

> The slippered hours their placid business ply,
> *And in thy hand there lies occasion's pearl,*
> But thou art playing with it absently,
> And dreaming, like a girl.[1]

14. Conclusion

My study of stimuli has been mainly a search for their later effects, and a plea for discriminating emphasis upon those which really lift the economic life. But I have not here studied the motives and causes of stimulus—the kinds of incentive in which increment is possible—the prides,

[1] A. Y. Campbell, " Animula Vagula."

passions, ambitions, sympathies and ideals of men. Sargant Florence in discussing Wagner's famous five main classes of motive [1] says: "The cash nexus is the chief bond between the worker and his work, and other possible forms of incentive, the hobby nexus, the duty nexus, and fame nexus, lie neglected." It is a field too vast, and even mysterious. A man may be running "all out" for a £100 prize. In the last lap if it were shouted to him through a megaphone that the prize was doubled, he probably would and could do no better. But a dash of cold water or a burst of cheering might stimulate him to even greater exertion. In the Irish Rugby international,[2] Arthur Young played for all that was in him. He got some cuts on the head during the game, went off and had it bandaged. After that he played like one possessed. There are the ultimate bases of incentive which seem to lend themselves to different degrees of excitation, as Kipling knew:

> If you can force your heart and nerve and sinew
> To serve your turn long after they are gone,
> And so hold on when there is nothing in you
> Except the will which says to them Hold on,

—a great recognition of the unexpected reserves of energy that are only drawn upon by emergency.

The economic response may conceivably be attained by new or substituted incentive, in which the laws of increment may differ. The stimulus along the wage incentive may conceivably have one kind of reaction, whereas that to the fame or hobby incentive may have quite another. It may thus be possible to get a permanent gain to stimulus by changing the form of the incentive. Physiologically, the reactions to substituted stimulus have not indeed shown this, but there is frequently no exact parallel between the physiological and the mental.[3] Again, in a different environment all our findings may alter. Professor Whitehead instances the new mentality of the past three hundred years, which is "more important than the new science and the new technology, so that now the *old stimuli provoke a*

[1] "Economics of Fatigue," p. 73. [2] 1927, at Twickenham.
[3] Watson, "Psychology."

new response." [1] In an environment with a higher sense of duty or a different ethical bias, the response to an extra-profit stimulus or to a higher wage stimulus may be entirely different.

Probably these subjective bases of economic life differ less amongst masses of mankind at one time or across the ages than the manifold objective manifestations of that economic life itself :

> We see by the light of a thousand years
> And the knowledge of millions of men.[2]

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[1] " Science and the Modern World."
[2] *Engineering*, 12th Jan. 1900.

THE MEASUREMENT OF ECONOMIC FACTORS

VII

STATISTICAL METHODS

From the minutes of the Political Economy Club, 4th December, 1834.

Question discussed.—With what limitations is the information derived from Statistical Tables, and from what are called facts, to be received in the study of Political Economy?

VII

STATISTICAL METHODS [1]

1. Introduction

"Science sans expérience
N'apporte pas grande assurance."—"Paré's Canon" (1510–1590).

Anyone who reflects upon the troubles and problems of the civilised world to-day must realise that questions are constantly put to economic science to which no clear answer, and sometimes no answer at all, is being given. If we are satisfied that no body of knowledge is worthy the name of science unless it has a capacity for development to meet such new needs, we shall be looking round to see upon what lines growth and change in economics must take place. Will the old methods of inquiry and proof suffice, or must we seek new ones, not necessarily "better," but more adapted to cope with the fresh problem and to unfold hidden secrets?

It is my view that the analytical method in the line of Ricardo, Mill and Marshall has, for the time being, at any rate, reached the limit of its usefulness, and that no striking advance can be made thereby from the ground now occupied. I do not think, moreover, that the refinements and extension of it in the mathematical or Cambridge School are likely to lead to important results. Certainly inductions by the Historical School must be so broad, and so lacking in touch with modern data, that they will yield only a small contribution to the constructive problems of the moment.

I believe that for the next advance we must depend upon realistic statistical investigation and verification, and that we stand on the threshold of a new method, which is of general application.

[1] The Sidney Ball Lecture, 1926–1927 at Oxford, under the title: "The Statistical Verification of Social and Economic Theory," with additions and modifications.

The device of " sampling "—long suspect as if it led to mere generalisation from the particular—with its recognised tests for a limit of error, and the great assurance which conformity to the " normal curve of error " may now give—can be applied to a wide variety of economic facts. In the past statistics seemed to be valuable only so far as they dealt with aggregates and told the " whole story." But statistics for aggregates are often unattainable or unmanageable, and indeed more liable to error from extraneous causes than statistics taken at random, but clean from a disturbing element which destroys the value of the particular kinds of inference sought. A sample, unbiased in any other direction, but avoiding the element in question, may afford a clearer view than aggregated statistics. Many detailed investigations have, of course, been made in the past to establish general *facts* which are otherwise open to dispute, such as the density of particular populations, the ratio of rent to income, or the distribution of income, but ordinarily no direct use has been made of such facts, when ascertained, to develop theory and generalisation of principle. Two types of *ad hoc* inquiry are possible : first that approximating in character to the older type, viz. without any preconceived theoretical rules in mind, to establish a body of facts or relationships, and then to elaborate a theoretical explanation of them which shall supplement, or fit into, the general body of economic theory. Here a theory is made to account for the facts. The second is to take a definite theoretical principle as a question to be answered : Does this really exist in fact ? and then to make a careful test from existing data or to collect data specially for the purpose. Here facts are ransacked to see if the theory lies in them.

The new type of special investigation on the social side for the collection of facts was carried to a higher stage of scientific accuracy and usefulness by Mr. and Mrs. Sidney Webb, and on its statistical side by Francis Galton and Charles Booth. Charles Booth was disturbed by the contradictory social theories about the poor :

" In the opinion of some, the great evils to be met were improvidence and self-indulgence. To relieve from the conse-

quences of these was to aggravate the mischief. Yet another view was held, that the selfishness and vice of low lives was the result of the selfishness and vice of high lives; that the first duty of the rich was to produce among their poorer neighbours the physical condition which alone could render decent existence possible. Good air, more room, better clothes, better food and similar advantages would exorcise the demon which ran rife. 'Stimulate private charity,' said one school. 'Relieve the rates.' 'It is the State-paid pauper who is the source of all harm.' 'Down with charity,' said another set; 'the very word has become a degradation. Let the State see to it that the toiling millions are fed and housed as they should be.' 'Toiling millions!' would be replied. 'The people who are in want never really toil at all. They are wastrels, lazy and ill-tempered. No one in England who will work need want.' . . . These various views, and many others, were listened to by Charles Booth, and ever more earnestly did he seek an answer to the questions: Who are the people of England? How do they really live? What do they really want? Do they want what is good, and if so, how is it to be given to them?" [1]

In an address to the Royal Statistical Society in 1887 he referred to the "sense of helplessness" on all sides:

"To relieve this sense of helplessness, the problems of human life must be better stated. The *a priori* reasoning of political economy, orthodox and unorthodox alike, fails from want of reality. At its base are a series of assumptions very imperfectly connected with the observed facts of life. We need to begin with a true picture of the modern industrial organism, the interchange of service, the exercise of faculty, the demands and satisfaction of desire. It is the possibility of such a picture as this that I wish to suggest, and it is as a contribution to it that I have written this paper." [2]

This is not the place for an assessment of the value of Booth's statistical conclusions from his examination into the conditions of London life, nor their influence in correcting current conceptions of fact and tendency, nor the remoter reactions on social and economic theory. An interesting and sufficient account may be found in Mrs. Sidney Webb's autobiography, "My Apprenticeship." Booth's questions were hardly those of a theoretical or academic economist,

[1] "Charles Booth: A Memoir" (Macmillan, 1918), by Mrs. Charles Booth, pp. 13–15.

[2] "Condition and Occupations of the People of the Tower Hamlets, 1886–1887," by Charles Booth, 1887, p. 7.

but his method of *ad hoc* inquiry to test theories of social betterment were the forerunners of the specific investigation of later days.

2. Modern Developments in Exposition of Theory

Professor Marshall's volume on Principles may be taken as the great example of exposition of economic theory on lines new thirty-six years ago and hardly yet superseded. It is interesting to examine its dependence, not so much upon statistical illustration as upon statistical verification. There are several tables (population, growth of wealth, etc.) used to aid the descriptive portions. When dealing with the nature of the " demand curve " and " elasticity," he refers to the study of exact lists of demand prices and to the difficulty of interpreting them, but he gives no examples, and indicates diagrammatically how to observe percentage increases over a period of years or the rate of growth. He thinks that the statistics of consumption published by governments for many commodities are of very little service in helping inductive study, but elaborates the hint given in Jevons' theory " that traders could further it greatly by analysing their own accounts." " If a sufficient number of tables by different sections of society could be obtained, they would afford the means of estimating indirectly the variations in total demand that would result from extreme variations in price, and thus attaining an end which is inaccessible by any other route." After analysing the doctrine of maximum satisfaction, and the effect of taxation, he urges the need for more statistics. In dealing with the nature of profits and the element of risk, he deplores the absence of statistics of capital in different businesses. From the statistics of American bureaux, unspecified by him, " inexact as they are," he says, " we may conclude that the annual output is less than the capital in industries where the plant is very expensive and the processes very long, but is four times the capital where raw material is expensive and production rapid." He also draws inferences about the ratio of turnover and circulating capital to the wages bill.

But this is virtually the only statistical "verification" in the book. Elsewhere (p. 492) he deplores that public statistics are not yet properly organised. "The few, therefore, get their way, although if statistical measures of the interests involved were available, it might prove that the aggregate of the interests of the few was only a tenth or a hundredth part of the aggregation of the interests of the silent many." He hoped that, in future, statistics of consumption would be so organised as to afford demand schedules to show the amount of "consumers' surplus," and to give a guide to public action. The idea of testing correlation, or sampling for modal types, is hardly even germinal in his treatment. A superficial observer might imagine that because the volume is full of mathematics and graphs, and because statistical science also employs mathematics and graphs, his work is statistical. But in fact they are the poles apart: one is the refinement of analysis and the deductive method; the other the advanced spirit of induction.

Writing at the same time (1891) on the "Scope and Method of Political Economy," Dr. J. Neville Keynes dealt with the method of specific experience, the deductive method, symbolical and diagrammatic methods, the historical method, and wound up with "Political Economy and Statistics." He dealt with concomitant variations and the method of curves, and said the functions of statistics in economic theory are, first, to suggest empirical laws, secondly, to supplement deductive reasoning by the test of experience, and thirdly, to elucidate and interpret particular concrete phenomena. As illustrations he gave Malthus' inquiries concerning the marriage rate and fertility rate and his inference that population tends to double in twenty-five years—a statistical rather than an economic inference, be it noted. The tendency of financial crises to recur at periodical intervals was *not* first worked out theoretically, it was disclosed by statistical observations and theories afterwards propounded to account for it. Another simple illustration was the autumnal drain on the money market. As an example of deductive verification, Dr. Keynes cited Bagehot's

statistical study testing the legitimacy of the postulate that in modern industrial communities there tends to be movement of labour from the worse to the better-paid localities—the "tides of people." He elaborated the dangers present and the precautions necessary, but concluded that the statistical method easily makes good its claim to rank as a thoroughly effective and reliable instrument of science.

At a later date, nineteen years ago, Marshall said to the Royal Economic Society, "Qualitative analysis has done the greater part of its work . . . the higher and more difficult task of quantitative analysis must wait upon the slow growth of thorough realistic statistics." As Professor Wesley Mitchell has said, this is not a pronouncement of antagonisms, for we all practise both, "shifting our emphasis according to the task we have in hand . . . qualitative analysis cannot be dispensed with, because quantitative work itself involves distinctions of kind, which start with distinctions of quality." [1]

When we come to a similar theoretical work written thirty years later than Marshall's "Principles" and Dr. Keynes' work, Professor Pigou's "Economics of Welfare," we find a considerable development in the extent to which theoretical findings are "checked up," so to speak, by reference to statistical investigation. This is partly because the fund of continuous public statistics is fuller, but also because direct inquiries are more available. The coefficient of correlation appears in the actual text. Much of the Malthusian and Ricardian economics turned upon the direct relation between the fertility of the working population and the amount of remuneration, the inevitable tendency for population to multiply up to the level of subsistence, so that any attempt to raise the level of subsistence must be thwarted. The iron law of wages made a dismal science indeed. The progress of the nineteenth century did much under general observation to show that the birth-rate and raised standard were not directly, but inversely, related. One cannot imagine a doctrine calculated to be more subversive of early

[1] Address to the Economic Association at Chicago, 1924.

economic theory. Even the eighteenth-century doctrine of the incidence of taxation was bound up with this conception. It was said to be impossible to tax the working classes, because they were already only on the level of subsistence—encroachment on this would lessen their numbers by starvation and lower fertility, and the supply price of labour would rise to the original level. To some extent, in the then stage of education and civilisation, the subsistence doctrine had a substratum of fact. But the trail of it has lain across too long a period of years since, during which the tendency has been reversed. Brentano's contentions are taken up by Pigou, and detailed confirmation is found in Dr. Heron's statistical study of London, in Bertillon's work, and in papers in the *Statistical Journal* by Dr. Stevenson, Yule and Dr. Leonard Darwin, from which Pigou concludes: "The above discussion disproves the suggestion that the beneficial effect on economic welfare of an increase in the real income of wage earners will be neutralised by an expansion of population." [1]

In his treatment of the useful and well-known doctrines of Economics upon diminishing and increasing returns and their relation to price, monopoly and taxation, Pigou remarks that they are results in pure theory.

"We have made a number of boxes and sub-boxes, labelled strong increasing returns, weak increasing returns, constant returns, diminishing returns, etc., but they are *empty* boxes and, therefore, some say useless except as toys, for we do not know to which of them the actual industries of real life belong. Statistical technique by itself, in spite of the growing volume and improving qualities of the material available, will not enable us to accomplish this, for statistics refer only to the past. But able business men with a detailed realistic knowledge of the conditions of their several industries should be able to provide

[1] This had indeed been one of the "discoveries" from Charles Booth's inquiry. "To one who had been brought up in the political economy of Malthus, and taught to believe that every increment of income and security would inevitably be accompanied by additional children in working-class families, it was disconcerting to discover that the greater the poverty and overcrowding, and especially the greater the insecurity of the livelihood, the more reckless became the breeding of children; whilst every increment in income, and especially every rise in the regularity and the security of the income in working-class families, was found to be accompanied, according to the statistics, by a more successful control of the birth-rate."

economists with raw material for rough judgments. Economists unaided cannot fill their empty boxes, because they lack the necessary realistic knowledge, and business men unaided cannot fill them, because they do not know where or what the boxes are. With collaboration, however, it is not unreasonable to hope that some measure of success may eventually be achieved. At least, the effort is worth making. It is premature, in impatience at the present shortage of straw, to scrap our brickmaking machinery. It is the better part to advertise abroad the urgent need for straw and to call for students to produce it."

No one should fail to read Dr. Clapham's witty and penetrating article on "Empty Economic Boxes" in the *Economic Journal*, 1922, and Professor Pigou's rejoinder. Says the economic historian, weary of analysis :

"I myself did not appreciate how completely empty the boxes were until I had given a number of public demonstrations with them. And if more acute minds are not likely to be so misled, the rank and file surely are. Unless we have a good prospect in the near future of filling the boxes reasonably full, there is, I hold, grave danger to an essentially practical science, such as Economics, in the elaboration of hypothetical conclusions about, say, human welfare and taxes in relation to industries which cannot be specified."

Professor Pigou remarks that Dr. Clapham "maintains three separate things : first, that his economic boxes, so long as they are empty, cannot have practical usefulness; secondly, that, even if they were filled, they would not have practical usefulness; thirdly, that they cannot be filled." When he deals with the third he concludes :

"To declare, of a piece of work that has not yet been seriously tackled, that it is impossible, is, in my judgment, at least premature. Something, I believe, might be accomplished if economists would take counsel with leaders of business, expert in particular branches of production. Of course, if Dr. Clapham, or anybody else, goes to them and says, 'My dear fellows, an "analytic" up at Cambridge wants to know if your industries obey the laws of diminishing, constant or increasing returns,' no great illumination is likely to result. But if he were to ask them to discuss the conditions, as regards the relation between aggregate output and cost, under which various important articles have been and are being produced—which is really asking a great deal more—I for one do not believe that he would always come empty away. Nor need we rely only on the general judg-

ment of people expert in particular industries. There is already available a certain amount of statistical material—and we may reasonably hope that this material will both grow in quantity and improve in quality—from which students with the requisite mathematical equipment may make rough deductions about the shapes of certain supply schedules. On the side of demand something on these lines has already been accomplished. On the side of supply the task is undoubtedly more difficult. But we need not conclude that it is impossible. The hope of which I have just spoken, that better statistical material may presently be available for study, thus making the inquiry more feasible than it has been hitherto, should itself forbid that. There is indeed a lion in the path; the fact that those people—with the towering exception of Jevons—who have the qualities required for conducting a detailed intensive study of particular industries and writing monographs about them, are not usually well versed either in the more intricate parts of economic analysis or in modern statistical technique; while the 'analytics' lack alike capacity and inclination for these detailed studies. For this there is only one real remedy. We must endeavour to train up more men of the calibre of Jevons, who are equally at home in both fields. Till we can accomplish that, the next best thing, for those lesser persons who are moderately qualified for the one sort of inquiry and for the other, is to work together in combination, and not to waste time in quarrelling, perhaps on the basis of an imperfect understanding, with the deficiencies of one another's methods."

Dr. Clapham retorts:

"I had anticipated that the facts and statistics demanded might be, by common consent, at present unprocurable; but I had hoped that they might be specified. And now I am paid with a cheque drawn on the bank of an unborn Jevons. Can no one give us more current coin?"

Professor Pigou's "Industrial Fluctuations" (1927) [1] will stand as almost a landmark in the development of method, for it employs, to an extent hitherto not found in a work of this size, the method of direct and *ad hoc* statistical verification, by correlation, lagging and the ratio of dispersion or variation. While the broad features of concomitant variation are established, in accord with general impression or theory, by exact tabulation and charting, eliminating a constant trend, the author proceeds to much

[1] Vide *Economic Journal*, September 1927.

finer uses, and tests every statement as a precedence of events, and suggested causation, by correlating straight against lagged series. Moreover, amplitude of fluctuation being a very essential feature of the inquiry, the ratio of variation, or fullness of swing, comes under scrutiny in the same way. Thus we have (*a*) demonstrations of the statement that production fluctuates less extensively than employment, and a clear measure of the difference in amplitude; (*b*) a proof of the concordance and dependence and precedence of fluctuations of different industries, but of the markedly different *degree* of fluctuation as between instrumental and consumption trades; (*c*) another of the fact that accumulations of mobile resources are not the dominant influence making for industrial expansion, in which case interest would be low in good times and high in bad times, proving by the charts and tables that the dominant causal factor is on the side of expectations of profit; (*d*) an examination of the causal connection between good harvests and the expansion of industry, by comparing unemployment percentages and the quotients obtained by dividing the index of mineral prices by the prices of vegetable foods; (*e*) a test of the theory that booms of industry are caused by a cheapening of foreign food in terms of British manufacture; (*f*) an examination of the correlation (in the United States) between agricultural crops (yield per acre) and immediately subsequent changes in business activity; (*g*) the diminishing importance of this connection, due to world markets and prices and to advance dealing, (*h*) proof that stoppages of work due to industrial disputes involve smaller contractions of industrial activity than might *prima facie* appear probable; (*i*) establishment of the consilience between good employment and high prices, and the intimate part played by money (after eliminating long-period trends in price); (*j*) indication of the relation between real floating capital, provided through creation of new banking credits, and industrial activity; (*k*) a critical test of an American economist's thesis that the short-period variation in the frequency with which monetary circulating media change hands cancels out with short-period variations in the volume

of trade, leaving the *quantity* of circulating media as the sole un-neutralised factor; (*l*) examination of the causal relation between the *rate* at which prices are rising and falling, and the volume of industrial activity, and various other analogous problems. The apparatus of these tests is not forbidding, with equations and coefficients, but is beautifully exhibited in graphic form, easily followed by the eye. Nowhere has the new method, so full of importance for the future of economic analysis, been carried to such clear and definite usage.

3. Recent Comments on the Old Methods

Wesley Mitchell inclines to support the view that quantitative analysis "shows no more promise of providing a statistical complement of pure theory" than it has ever done, if by pure theory we are thinking of analysis according to Jevons and Marshall. And he says it never will, unless we recast the old problems into "new forms amenable to statistical attack," and this involves a change in the content of economic theory. He illustrates this as follows: In the course of his investigations into economic cycles, Professor Henry L. Moore needed to formulate "the concrete laws of demand for the representative crops." He approached this task by quoting Dr. Marshall's qualitative analysis of demand. But with Marshall's formulation of the problem it was impossible to get quantitative results. For Marshall treated the relation between demand and price on the assumptions (1) that the changes in the two variables are infinitesimal, (2) that the conditions remain constant, and (3) that the shape of the demand curve is known. Professor Moore, on the contrary, had to derive his curves of demand, and to deal with the real world where no factor is known to remain constant and where changes in demand and price are finite. Attacking his problem by mathematical statistics, Moore obtained equations expressing the relations between the demands for and the prices of corn, hay, oats and potatoes; he determined the precision of these equations as formulas for predicting prices, and he measured the

elasticity of demand for each crop. As he pointed out in concluding the discussion, his results do not solve Marshall's problem.

But is not Moore's problem more significant theoretically, as well as more relevant to economic practice? If quantitative analysis can give us empirically valid demand curves and coefficients of elasticity for numerous commodities, shall we not have a better theory of demand than qualitative analysis can supply?

Wesley Mitchell discusses whether the view, held by many statistical economists to-day, that the function of statistics is to provide a statistical complement for economics and not to recast economic theory, is sound. He bases his preference for the most radical suggestion on a very suggestive consideration of what has happened in physics.

"The mechanical view involves the notions of sameness, of certainty, of invariant laws; the statistical view involves the notions of variety, of probability, of approximations. Yet Clerk-Maxwell's 'new kind of uniformity' was found to yield results in many physical problems which corresponded closely to results attained on mechanical lines.

"Such a close correspondence between the results based on speculation and the results based on statistical observation is not to be expected in economics, for three reasons. First, the cases summed up in our statistics seldom if ever approach in number the millions of millions of molecules, or atoms, or electrons of the physicist. Second, the units in economic aggregates are less similar than the molecules or atoms of a given element. Third, we cannot approach closely the isolation practices of the laboratory. For these reasons the elements of variety, of uncertainty, of imperfect approximation are more prominent in the statistical work of the social sciences than in the statistical work of the natural sciences.

"And because our statistical results are so marked by these imperfections they do not approach so closely to the results of our reasoning on the basis of assumed premises. Hence the development of statistical method may be expected to make more radical changes in economic than it makes in physical theory."

Josiah Royce says: "Not the mechanical, but the statistical, form is the canonical form of scientific theory."

The analysts reach their mass generalisations about

markets and demand by considering the individual's behaviour and multiplying him into results which can never be precise, whereas the statistician slips the individual stage and treats of masses and modes direct.

"With the fuller reports they are obtaining and the more powerful technique they are developing, properly equipped investigators can study the relations between the actual responses of prices to changes in supply and of supply to changes in prices. They can work out demand schedules which hold empirically within the ranges and periods covered by experience. They can trace the changes in the consumption of commodities by whole communities or by large groups. They can investigate the relations between monetary changes and 'real' incomes, between saving and spending, between different forms of economic organisation and production.

"With all these fascinating problems and numberless others before them in shape for attack, it seems unlikely that the quantitative workers will retain a keen interest in imaginary individuals coming to imaginary markets with ready-made scales of bid and offer prices. Their theories will probably be theories about the relationships among the variables which measure objective processes. There is little likelihood that the old explanations will be refuted by these investigators, but much likelihood that they will be disregarded."

But these subjects are not the only ones to which the new methods are suitable and indeed essential, for they apply certainly to some in which the old analysis has been helpless, such as the exact relation, with time changes or constant growth, between different series, output, costs, wages, etc. The quantitative workers cannot content themselves by staying always on the money level of analysis, or always on the commodity level; and "they cannot pass back and forth between the two levels without realising what they are doing, as could the classical economists and their followers." In particular, the influence of changing price levels upon business activity can yield only to this kind of investigation. Again, as Wesley Mitchell says, the quantitative workers will have a special predilection for institutional problems, because institutions standardise behaviour, and thereby facilitate statistical procedure.

"In proportion as economists face real problems they

will strive to cast even their general theory into the quantitative mould." [1]

Professor F. C. Mills [2] says: "The future development of economics as an effective instrument of social control will undoubtedly be conditioned largely by the use made of these tools." He is especially illuminating when treating of the analogy between physics and Economics: "Economists . . . are handling material characterised by a high degree of variation. The application of the mechanical method, which may involve but small errors in the physical sciences, results in wide discrepancies in the economic sphere between laws of rigid mechanical type and the facts of economic life. This condition tends to bring about that emasculation of generalisations by a continual process of hedging and qualification which has been characteristic of economics." . . . "Failing to employ appropriate instruments, their statements tend to be loose and ambiguous, their conclusions to lack precision, and their laws to lack authority." Professor Mills stresses the importance of testing the instruments for "stability" of results in every possible way, as opposed to the mathematical method of computing probabilities from a single sample, with particular reference to Mr. J. M. Keynes' criticisms of method ("Probability," Chap. 2).

4. The United States and Britain—a Present Contrast

If we refer to the United States in particular, we immediately see a great improvement in recent years. First, the body of statistical material has grown; secondly, technical methods of statistical analysis are much better; thirdly, the funds and agencies for the laboratory work are much increased, with numerous endowed organisations for research. In this country it would, I think, be true to say that aggregated and national statistics have considerably improved, although we are still without any knowledge of total production,[3] and have not much knowledge of changes in dis-

[1] "The Prospects of Economics," in "The Trend of Economics," 1924.
[2] In the same collection, p. 37.
[3] Recently (1928) remedied by the Index of Production.

tribution of income and the net product, while our banking statistics are very difficult to interpret and not so complete as they used to be. But in the field of sampled or *ad hoc* inquiry we are very weak indeed, depending on the efforts of individual statisticians and research students, with very little team work. Our technical equipment is just as good in quality as that in the United States, but there are fewer craftsmen. This is partly because in the third respect we are completely behind the United States, and we have practically no endowed statistical inquiry. The London and Cambridge Economic Service has to rely largely on annual subscriptions from business firms. The importance of this difference cannot be exaggerated, for, as Wesley Mitchell rightly says, the quantitative method, unlike the qualitative, which needs only a thinker and his books and pencil, has to face a heavy burden of routine labour, computers and field workers.

The list of institutions in the United States which are responsible for co-ordinated team work and diagnosis is now very imposing.

5. Examples

(*a*) *Time Series with Published Statistics*

It has been shown that there are two distinct aspects of statistical inquiry. In the *first*, the statistics are gathered and massed for their own sake, uniformities and variations are noticed, and hypotheses constructed to account for the changes, which hypotheses may rest on physical facts, *i.e.* sunspots and harvests; or economic theories, *i.e.* credit control; or a combination of physical fact and economic theory, *i.e.* aggregate gold production and credit based thereon.

In the *second* aspect, a theory exists, and a statistical inquiry is undertaken *ad hoc* to test it :

(1) A *new* set of aggregated statistics is collected by public or private authorities to solve a problem, or
(2) Samples are made on scientific lines for different places or for different times, or

(3) Existing lines of statistics are put into juxtaposition for the first time, and correlation is tested or the ratio of variation ascertained. In other words, it may be ascertained that two series move sympathetically, and we wish to know the regularity and constancy of that sympathy. It is, for example, one thing to say that when set A of facts varies in one direction set B will vary in a specified direction in 95 per cent. of the cases; it is another to determine that when one varies by 10 per cent. from its own average, the other will vary 20 per cent. from its own average.

In 1918 I made the first use in this country of the linear trend, fitted by the method of least squares, to eliminate the common time-growth element from various series of statistics which had different rates of growth, in order that the concomitant variations, free from such constant growth, could be correlated. In the "Effect of Trade Fluctuations upon Profits," [1] I remarked:

"In our pre-war experience when monthly statistics of foreign trade were quoted or the bankers' clearing-house figures were referred to, all kinds of inferences were drawn for and against the political features of the day. If the 'returns' were up by 10 per cent. on the previous year, it was held to be something for jubilation, if they were down, perhaps the tariff controversy took on a new twist. But we do not do increased trade for its own sake —we do it because we hope for increased profits. And there was always the assumption that the up and down movement of trade connoted a related degree of altered 'profit' prosperity. (There was the further ethical or teleological assumption, I suppose, that if we all made more profits, then we were all so much happier and better off.) But in many of our minds, as we looked at the figures, there were misgivings and unsettled questions; what would the increase be like if the natural growth of population were taken into account and how far was it a *real* increase in output of commodities, as distinct from an increase due to higher 'prices' for the old quantity of goods? If a given measure of trade has risen, say from £100 to £120, and we rejoice in a rise of 20 per cent., it may be either that 120 units have been sold instead of 100 at a regular price of £1 or that 100 units have been sold at a price of £1 4s. each instead of £1, or the result may be a combination of both changed quantity and changed price;

[1] *Journal of the Royal Statistical Society*, 1918.

it may even be that one factor has actually *diminished*, but that its effect is more than offset by the increase in the other. What is the actual or probable change in profit that accompanies such a change of 20 per cent. according to the cause of the change? Will a like change accompany a second, or third ensuing rise of 20 per cent.? Will the relations found to exist for increases hold also for decreases, or what difference may we expect? These are all questions to which we should like answers, and they suggest many more. For trade in general it may be said that our notions about the relative influence of quantity and price upon profits are very theoretical and abstract."

I used, in addition to correlations of the variation from the linear trend, deviations about the moving average and correlation of variate differences, first and second. For the relation between coal profits and tonnage and price I arrived at definite results, showing that the change in profits due to a change in price had been three times as great as the price change, *i.e.* that a 1 per cent. fluctuation in price was accompanied by a 3 per cent. fluctuation in profit. But in the case of a unit variation in output, the change in profit was only quite a small fraction over unity. In these investigations all the coefficients of correlation were very high, and it may be said that I was merely putting into elaborate figures conclusions that would be obvious to ordinary reflection. But the real object was to find the ratio of variation, and especially to disentangle the effects of price changes and output changes. The fact that demand for coal tends to be very inelastic in the *neighbourhood* of any normal condition is also deducible from the inquiry. I also showed that increase in the prosperity of the coal industry may be symptomatic of increased trade generally, if due to increased output only. The correlation between railway profits and the price of coal was negative, but high and significant, *i.e.* if the price of coal was markedly increased, then the railway profits were clearly less in the following year—a lag of a year giving the most marked correlation. The deviation of railway profits from the trend was about one-quarter of the opposite deviation of coal prices. Gas profits had a similar negative correlation with coal prices, and the deviation about two-thirds in amplitude. The

monthly correlation of the buying price of raw textiles in an Eastern market, and the selling price in London, over seven years, proved to be almost complete (0·97), so that fluctuations in a merchant's total profits were entirely due to volume of trade. Cotton spinning gave an interesting result.

"There is very little regular relationship between the profits of cotton spinning and either the purchase price of raw cotton or the sale price of yarn, but the changes in the *difference* between the two prices is more indicative of changes in the amount of profits. Of late years the quantity of raw cotton imported has been some criterion of the prosperity of the trade. The purchase price of raw cotton and the sale price of yarn are very closely related indeed.

"The fluctuations in the profits of spinning are very violent. The deviation of the price from the trend of prices is 14·4 per cent. on the average price, but the deviation of profits is 154 per cent. or nearly eleven times as great. (Standard deviation taken.) Reckoned by another method also, it is ten times as great (average deviation). It may fairly be said the fluctuations in profits are ten times as great as fluctuations in prices."

As regards general profits, I was able to come to such conclusions as the following:

"Speaking for the results of trade as a whole, the statistics of the Bankers' Clearing House and of the railway receipts (or tonnage) have afforded a reliable test as to the *direction* of the movements in profits, and the movement of foreign trade is also a fair but less important criterion.

"The fluctuation in profits has generally been rather less, in *magnitude* or *range*, than the fluctuation in statistics of 'turnover,' such as banking or foreign trade statistics, which reflect both quantities and prices, and it may be taken roughly at two-thirds to three-fourths of such short-period changes in trade returns.

"The influence of a change in price level on profits *as a whole* is far less than is frequently supposed by those who base their views upon observations of the striking effect of price changes in particular industries.

"In times of rising prices, increases in profits have been made over and above the amount that would arise upon the increased output that such prices induce, but the additional profit is not usually much greater in proportion than the rise in price, if the period taken is not less than a year. There is no evidence as to the effect of such changes measured over shorter periods than a year.

"Although the increased quantities evoked by increased prices have followed quickly enough to keep profits within such limits, the check has not been permanent, and continually renewed stimulus by the raising of the price level has resulted in increases of profits much greater than could have followed the ordinary increases in output (due to increasing population) at a constant price level. Similarly the drop in prices from 1880 to 1895 kept profits down considerably below what would have resulted from the *actual* output at a constant price level, and in itself was instrumental in depressing that output.

"The 'turnover' of foreign trade had become a *relatively* less important part of the whole trade of the country during the previous thirty years.

"The annual trend of increase in trade freed from all fluctuation has to a great extent been made up of the larger output of existing businesses increasing continually in size, and to a relatively smaller extent of the output added by new businesses."

The investigation had, perhaps, some value in indicating the kind of pitfalls that have to be avoided in dealing with this class of statistics, and the care that must be taken to make them "chemically clean," so to speak, before the investigation. Our own Oxford Professor Edgeworth remarked on this paper that there was ever in the class known as the non-statistical reader a

"natural and not altogether unhealthy suspicion of any technical method, any *organon* which seemed intended to supersede the use of common sense. It was Locke, or some one who wrote, like Locke, against the Aristotelian syllogism, who protested that the Almighty had not dealt so very sparingly with the noblest of his creatures as to make them only bipeds, leaving it to Aristotle to make them rational. A similar prejudice on the part of common sense against correlation and other mathematical instruments is to be apprehended."

(*b*) *Time Series without the "Growth" Element—Original Inquiry*

We can now look at an instance of a personal, as against a collective, inquiry.

Mr. Edgar Smith recently made an investigation, the results of which are given in his book "Common Stocks as Long-Term Investments"—what he describes as the record of the failure of facts to support a theory. The theory in question is that, during the period when the prices of goods

and services are falling, bonds are better investments than ordinary shares. He traces the effect of investments and holdings over the period of seventeen to twenty-two years, and finds that out of twelve tests the investor would have a much higher investment return from ordinary shares than from bonds. In every case except one the advantage is on the side of ordinary shares, when income and increase in capital value are added together. His investigation is well worth following. The broad conclusion that he arrives at is that, cumulatively, the results tend to show that well-diversified lists of common stocks, selected on simple and broad principles, respond to some underlying factor which gives them a margin of advantage over high-grade bonds for long-term investment. There are many reasons why this particular investigation has no universal validity, but it is an interesting example of the verification of theory. A similar test quoted by Mr. Hartley Withers for England, though much more limited, tends in the direction of confirming it, and Mr. Hartley Withers concludes that it has been shown that ordinary shares have advantages which make it impossible to regard them as necessarily so speculative that we ought to feel " rather ashamed of possessing them." [1]

Contributing subscribers to the National Bureau of Economic Research, New York, approve the development of " an organisation devoted to exact and impartial investigations in the field of economic, social and industrial science." A quite recent inquiry is entitled " Business Annals," and gives an analysis of business records of seventeen countries for periods ranging in some instances as far back as 1790. In many cases these are based on description, in others on statistics. A conspectus of business cycles is possible, giving five conventional values (with diagram shading) for prosperity, recession, depression, revival and war activity. When the years are arranged vertically and the countries horizontally, the differing shade values appear as irregular but definite vertical ribbons. Some of the inferences drawn may be quoted :

[1] " Hints about Investments," Chap. XII.

"As one would expect from England's position in international trade and finance, English cycles are more highly correlated with the cycles of other countries, than the cycles of other countries are correlated with each other. The closest agreements are found between English and French or English and German cycles; the loosest agreements are between Austrian and American cycles. . . .

"Thus no country in our list has had fewer business cycles since 1890 than the international pattern calls for; but the majority of countries have had one or two more than that number. These additional cycles seldom result from failure to participate in the international movements of activity and depression, but rather from the intercalation of what we may call domestic recessions between the dates of international recessions. . . .

"Whatever the causes of the recurrent fluctuations in economic activity may be, the annals suggest that these causes become active in all communities where there has developed an economic organisation approximating to that of Western Europe. There appears to be a rough parallelism between the stage attained in the evolution of this organisation by different countries, and the prominence of business cycles as a factor in their fortunes. . . .

"One characteristic of the type of organisation in question is the wide area over which it integrates and co-ordinates economic activities. Bare as they are and short their span, the annals reveal a secular trend toward territorial expansion of business relations and a concomitant trend toward economic unity. . . ."

A third example of a time-series test of theory is one I gave recently to show the correlation between fluctuations in real wages, unemployment and aggregate production.[1] My feeling has always been that one can only attempt to secure a real wage higher than the total production justifies by letting the strongest and best-organised workers present their claim first, and thus leave those who are in a weaker strategic position to "come to the bag" and find nothing there—in other words, by suffering considerable unemployment in the unsheltered trades. This view finds simple but striking confirmation in a study made by Professor Rueff, of the University of Paris, published recently in the *Revue Politique et Parlementaire*.

For the seven years 1919 to 1925 there is an almost complete

[1] *Financial Times, Special Supplement*, 15th March, 1926.

correspondence between the fluctuations of real wages—that is, nominal wages, divided by the level of prices to show what those wages will purchase and the trade union percentages of unemployed. It is striking to the eye in the exact parallel of the fluctuating curves, and still more remarkable expressed statistically. The degree of consilience may best be seen from the coefficient of correlation, which I compute as approximately + 0·95 (complete direct correlation being statistically known as + 1·0).

The Statist observes that " when prices fall more rapidly than money wages, unemployment increases." At such a time, of course, real wages tend to be higher. " When money wages tend to fall relatively to price movements, the unemployment curve shows a corresponding fall," or, in other words, at times when business is improving and employment increasing, prices are rising faster than wages and real wages tend to be falling. Now this is common theoretical knowledge, which hitherto has not had exact practical demonstration. It is the instantaneous character and continuity of the connection that is remarkable. Is it then impossible for business to improve and bring with it at the same time an improved real wage? The answer depends entirely upon the aggregate production and average output.

If business has become bad, with unemployment, because the real wage rate that it is attempting to pay has exceeded the real wage rate that is being produced, then it can only become better if these two are adjusted. But if that rise in prices which is partly the inducement to, and partly the effect of, better business, automatically brings about a rise in money wage rates per hour (by adjustment on a cost-of-living basis) without any corresponding increase in output per hour, adjustment is farther off than ever. The only true indication of the valid conditions under which a higher real wage is possible is a sensitive and complete Index of Production on national lines. In the absence of such an official index, I have taken the (private) quarterly production index produced by the London and Cambridge Economic Service, which is the best indication of production we possess, and, finding the extent to which each quarter's

figure has fallen below the 100 per cent. pre-war level, obtained what may be called an index of short output. I have plotted the results as a third line upon *The Statist* graph referred to above. Again, the agreement in detailed fluctuation is most remarkable and significant.

At the moment when output is least the rate of real wages is highest, and therefore the number who can be in receipt of such wages is greatly reduced, and increased unemployment is an essential corollary. At the times when output is improving the rate of real wages per person tends to be going down, and, therefore, the total number who can be paid such a wage is increasing. I need not refer to the monetary causes which are probably responsible for the simultaneous movement of all these lines, but I would urge that the pre-war cost-of-living fetish, which may work for or against the worker, according to circumstances, has in the past seven years obscured the exact relationship between the standard of life and the standard of output.

7. Examples—Relations between Business Factors

In an address to professional accountants on "Economics as an Exact Science" [1] I dealt with the possibility of confidential team work on the business results passing through their hands, and sketched some of the theoretical problems to be illustrated or investigated.

"All students of the subject, and even casual readers, are now familiar with the conception of the 'marginal business' which has been derived by deductive reasoning from the generalised conception of the principle of rent, and marginal utility. We know, in the abstract, that price is the figure at which the marginal business can just get a bare return upon the factors of production without going out of production, just as it also tends to be in equilibrium the cost of the last unit of production of other businesses, but I am not going to labour all the consequences of this theory. What I want to point out is that it has received little or no practical verification and examination in practice, though one may feel instinctively that it is true. The verification of it, and the discovery of its consequences in practice, rest entirely in the realm of accountancy. Suppose we took all the

[1] "Current Problems in Finance," I.

concerns that are on the margin—*i.e.* are making an economic rent on their employed capital but no profits above that—and then we take all those in the same trade or industry that are making something more than this rent—*i.e.* the intra-marginal concerns. Their results could be reduced to a unit cost of production if necessary. In some we should find the amount charged for economic return upon capital higher than in others possibly because the factory was erected in a comparatively disadvantageous position and the costs of erection were unduly high, or the lay-out was not good. Others will be influenced by a disadvantageous position, as shown by transport charges in the revenue account; others by disadvantages in distribution; others by excessive salaries, less efficient machinery, and so on. None of us has the slightest knowledge as to how the differentials of profit for profitable concerns, as compared with marginal concerns, are made up and classified, and to which elements of advantage most profits are due. . . .

"Can any of us at present hazard a guess as to how many marginal businesses there are in a trade, and as to how far profits over and above economic interest arise through disadvantages in situation, excessive capital expenditure, excessive distribution costs, and inferior organisation respectively?"

I will now take illustrations closely bearing upon these questions. A very excellent example, first, of what is possible in the field of definite investigation and, secondly, as to the practical position reached in the United States, is the work that is being done in the School of Commerce of the North-western University under the direction of Professor Secrist. It is impossible for me to give in detail the various monographs, but I will refer to one or two in particular. The inquiry into the expenses, profits and losses in meat stores brings together 143 businesses rendering uniform monthly statements. Apart altogether from the valuable statistical constants and limits that are reached, the following conclusions of theoretical interest, which would not be obvious by the light of nature, emerge. The typical or modal ratio of costs to sales ranges from 73 to 78 per cent. The ratio of cost increases as stores increase in size. It is lower for stores making profits than for those incurring losses. Stores making a profit have higher margins than those suffering a loss, *i.e.* the former 23·85 and the latter 18·89 per cent. of sales. But it has to be noted that moderate

margins are much more conducive to the realisations of net profits than those margins which are high. This conclusion might not easily be reached by purely deductive reasoning. The investigation brings out the main causes of high gross margins and low gross margins respectively. It confirms the view that stores which make a profit have lower operating expenses in term of sales than those which experience loss. There is a definite relation between the size of the store and the chance of making a net trading profit, proceeding as follows :

One-man stores	0·1	net trading profit	per	cent.	on sales.
Two-men stores	2·8	,,	,,	,,	,,
Three-men stores	4	,,	,,	,,	,,
Four-men or larger	5	,,	,,	,,	,,

In the larger ones losses are rarely incurred. Losses are much more common as the size gets gradually less. Inadequate margins are more responsible for losses than high operating expenses. Profits are most likely to be made when both the margin and expenses are moderate in amount. The single mass explanation of failure to make a reasonable profit is unintelligent competition resulting from poor location, lack of record showing true cost, and easy entrance into the trade.

Another study on " Commercial Rent as an Expense and its Relation to Profits " relates rent to sales and to total expense, and uses the coefficient of correlation, of dispersion and skewness. From 1914 to 1919 for one group and from 1916 to 1920 for another, the precise " diminution " of the rent element is brought out. When classified by size alone the rent element does not decrease regularly with increasing size of stores, that is, in relation to sales, but in relation to total expenses it does decrease regularly. Surprisingly uniform and persistent tendencies for profits to decrease as rentals increase have been discovered. This must not be taken as necessarily cause and effect. The association is clear, but which is cause and which is effect must be brought out by abstract reasoning.

The study of a seven years' view of the sales and expenses

of retail clothiers is an excellent illustration of the problems raised by diminishing costs. Decreases in sales are almost certain to accompany increases in expense in terms of sales. Again, decreases in sales are more certain to increase costs than are increases in sales to reduce them. Both decreases and increases in sales bring less proportional change in the cost of doing business in large than in small cities.

In another investigation the well-known concept "representative firm" is discussed with special reference to Marshall's use of the term. Other writers have followed Marshall in the general discussion of this concept—for example, Professor Taussig—but, so far as is known, no attempt has been made by anybody from experience quantitatively to describe the cost conditions of such firms, nor to identify the firms individually. In the whole of the investigation very strong modal types emerge, and there are some striking similarities to the results which the investigations of Dr. W. H. Coates in this country have shown. It was clear that the representative cost area on a five-year basis extended to positions 20 per cent. on either side adjacent to the average, but the actual *identity* of the so-called representative firms, to some extent, changes from year to year. Long-run representative costs may be clearly defined and stated, and there is a tendency for them to conform to average costs in the modal area, which is a position somewhat below average costs as trade is now conducted. They conclude that the existence of the "rent of business ability persistently makes for equilibrium at low-cost positions." This particular study deals direct with the theoretical concepts of normal prices, marginal costs, etc.

One of the most striking investigations for the purpose of testing economic theory in recent times in this country is that given by Dr. W. H. Coates before the Colwyn Committee on National Debt and Taxation. While holding the post of the Director of Statistics and Intelligence at the Inland Revenue Department, he made an investigation to deal direct with the vexed question of the incidence of income-tax. Economists are practically agreed that, by its very nature, income-tax stays where it is put, and cannot be

thrown off in price. If there is no profit there is no tax, and, therefore, tax cannot form part of the costs of production. But many business men hold strongly the contrary view, and say that a tax on income, like a tax on goods, is diffused over the whole community by means of higher prices. It is obvious that this is an absolutely crucial question in public finance and social theory. Dr. Coates took the relation between turnover and profit for a very large number of concerns for different years, and extracted from them all the usual statistical constants. He put two main questions for the application of this test.

"First, were typical industries of the country mainly in the hands of representative concerns, whose normal cost of production determines price, so that, by including income-tax in that cost, they could pass on the tax in price, as the business school contends, or, on the contrary, were they in the hands of concerns whose varying circumstances and ability show, in competitive conditions, results varying from losses, or small profits, up to large profits per unit of business? Secondly, how did the rate of profit secured by industry under conditions of high taxation compare with the rate of profit secured under conditions of low taxation? If the contention that high taxation is passed on to the consumer were correct, it seemed clear that the rate of profit (before payment of the tax) would need to be considerably higher when taxation was high than when it was low."

The first of these questions was answered clearly in the negative. The analysis for each trade group, for each period, showed the familiar distribution common to practically all natural phenomena when treated statistically. "The practical existence of the marginal concerns postulated by economic doctrine was clearly shown." In every case there was a material portion of the total business being done at a loss or no profit.

The second question, whether a proportionately higher rate of profit was secured during a period of high taxation than that obtained in a period of low taxation, was also answered by the statistics in the negative. The standard rate of tax in 1922 to 1923 was 4·28 times the amount of the rate in 1912 to 1913. If business in 1912 to 1913 yielded a profit of Y per cent., and that percentage included the

tax which had to be paid thereon, then on the theory that those in control of the business will not carry on unless they receive the same net reward for their efforts during the period of much higher taxation, when the rate of tax was 5*s*. in the £ the gross rate of profit on turnover would require to rise to 1·25 times *Y* per cent., or an increase on the original return of 23/90ths of its value. This increase, to be effective in its object, would require to be realised throughout the whole range of the dispersion, and the tables and graphs presented in the memorandum offer no evidence in support of any such increase. On the contrary, the earnings of the industry for these seven groups as a whole, before payment or deduction of income-tax, when related to the unit of the pound of turnover are practically the same in 1912 to 1913 and 1922 to 1923, notwithstanding the increase in the standard rate of income-tax by 328 per cent.

The whole of a large inquiry which I have very briefly summarised, is worthy of close study by economists and statisticians.

8. The Curriculum of the University

As raw material accumulates and as detailed results are co-ordinated, with recognised apparatus and outside support, the new students who are to advance the science must be increasingly directed along the appropriate lines if they are to help in establishing economics as a quantitative science. "In so far as they accomplish this aim," says Mitchell, "they will in transforming the subject make obsolete not only the qualitative work of Dr. Marshall and others, but also the crude beginnings of quantitative work which their elders are producing."

He foresees that the new literature will be numberless papers and monographs, and books will pass out of date more rapidly. No one will get the prestige of Mill and Marshall, for no one will cover the whole field. The detail that will pour into the research students' library will gradually make it more akin to physical investigation, save that the tests must be repeated from time to time, as no permanence

of data in economics is possible. But these, instead of being mere checks *superseding* the past checks, will have a dynamic relation to them, and this change in itself must be the subject of analysis and theorising, which will again enrich the science on its abstract side.

Moreover, each investigation is a double check upon a particular logical weakness of pure analysis. We cannot think of the result of motives in the mass without individualising those motives first, and we know how easy it is to go fatally wrong in passing from the particular to the general. It is here that statistical analysis gives a backward check upon all such aggregations of imaginary individuals, each of whom has a slightly different monetary measure of a particular unitary satisfaction or effort, and each of whom responds differently to a slight change, which is even more important.

There is a third way in which the analogy of physics or chemistry must be inexact. The elements behave in the same way whether the human mind is studying them or not, whereas economic tendencies and principles change *because* they are being studied. Obviously so much in them as depends on human psychology, knowledge or will, undergoes profound change as the human mind becomes conscious of what it is doing. As soon as we have completely discovered and understand what governs the business cycle it will probably almost cease to exist.

How does the University of Oxford stand towards such a movement as I have illustrated and outlined? I think the syllabus hardly concedes that radical changes are possible or desirable, still less that we should equip students to take part in them. I should be the last to say that somewhere in this country economics should not be studied in particular juxtaposition to history and philosophy, as it is studied in association with mathematics and science in Cambridge, or with administration and commerce in London, and I agree that Oxford is the fittest home for that study. But do we not seem inclined to treat it like a closed philosophical system, with Adam Smith as Aristotle and Ricardo as Plato? An outsider might gain the impression from the

curriculum, with the most recent of the set books mentioned therein a work nearly sixty years old, and the latest *date* actually mentioned that given in the heading, "Labour movements from 1815 to 1896," that it is not respectable to bring economics down to the problems of to-day. Doubtless that impression is erroneous in practice, but it is abundantly clear that the desirability of some training in published statistical data and in technique is not recognised. If this means that we in Oxford desire to take no part in advancing economic science, and are content with giving a liberal education in past history or modes of thought, it will suffice. But let that be frankly recognised. If, however, we desire to teach a living subject, and to make economists with the practical touch, and not mere historians of economic thought—if, indeed, we are to be really fair to the vast mental energies whose direction is entrusted to us, it will be necessary to give some thought to the new era of economic effort ahead of us.

Not much is needed in fact to give point to the present effort. A full chair in Statistics is not necessary, and if every student is required to take a course in elementary statistical methods, including correlation—without any necessary mastery of the mathematical principles underlying them—the case will be sufficiently met, though of course it is desirable to have available facilities for some more advanced work if possible. The truth is that, without some such equipment, no student will really be an "economist" in the sense which that term will soon come to bear.

Lord Kelvin said:

> "When you cannot measure what you are speaking about, when you cannot express it in numbers, your knowledge is of a meagre and unsatisfactory kind; it may be the beginning of knowledge, but you have scarcely in your thoughts advanced to the stage of a *science*, whatever the matter may be."

Chaucer, for the twentieth century, will stand:

> "In everything, I wot, ther lyeth mesure."
> (*Troilus*, ii. 715.)

ADDENDUM TO CHAPTER VII

Following upon this lecture, Mr. J. C. Cobb, of Boston, was prompted to write on the subject in the *Economic Journal*, March 1928, and to make an extended tour, in discussion with British economists, which resulted in the formation of a "Social Science Research Training Committee." This committee made the following announcement in July 1928 :—

"The great development of scientific research in economics and sociology along modern lines which has characterised the past decade, and is apparently going forward with increasing momentum, has made obvious a dearth of highly trained men to conduct the work. A lack of trained men is felt not only in the field of research, here perhaps more than abroad, but also in the staffs of instruction of the universities.

"The importance of realistic study in economic and social science is now generally recognised; so, too, is the urgency of the need for collecting and investigating quantitative data, whether statistical or relating to the action of groups or the interaction of economic and sociological phenomena, which may be examined by sample investigation or by comprehensive methods of observation, and may or may not be capable of numerically accurate measurement.

"With the object of providing such realistic study, and in order to assist and encourage young men to take up this work, and the universities to provide added facilities for their training, the Social Science Research Training Committee has been formed with membership as follows: Sir Josiah Stamp (chairman), Mr. Walter Layton, Mr. H. D. Henderson, the Right Hon. R. McKenna, Mrs. Sidney Webb, Mr. J. C. Cobb and Mr. C. E. R. Sherrington, secretary. The committee is broadly empowered to encourage and assist in any way the scientific development of economics and sociology, although it is the intention to make a main purpose of its work additions to the initial funds entrusted by interested persons to the committee's administration, and distribution of such funds in the form of scholarships to selected graduates of British universities who desire to undertake post-graduate work and especially fit themselves for research and intensive investigation, or for teaching positions in this field. In addition to the pecuniary aid, it is hoped and expected that the award of a scholarship by the committee will be of material value to the recipient in opening opportunities for future work.

"A further object of the committee is to encourage similarity

of method and terminology in different branches of social science in the several universities, in order to secure the advantages of interchangeability and comparability in the results of research work.

"In furtherance of this idea, and with an appreciation of the fact that the problems are becoming increasingly important internationally, an American has been appointed to the committee with the expectation that a similar committee will be formed in the United States to which will be appointed a British member of this committee. In the event of a similar committee being formed in any other country, this committee has power to increase its number to provide for a similar joint exchange of membership.

"It is expected ordinarily to award scholarships to students seeking a post-graduate degree, and it is not the intention of the committee to pass judgment on the work done, leaving entirely to the university under which it is conducted the evaluation of the work of the student and its significance for the degree sought, but the committee requests that there be filed with it a copy of the thesis or report of the work of a student holding a scholarship, to enable the committee to follow the results accomplished as a guide in its future work.

"As an initial step the committee hereby offers five scholarships to promote the study of economic problems to which the statistical method of investigation is applicable, open to graduates of British universities who intend to work at least two years for an advanced degree. Each scholarship is fixed at £120, payable £60 each year for two years, and may be held simultaneously with scholarships of any other kind. Applications must be made through a professor or head of department of a British university, stating the nature of the work contemplated and the training and qualifications of the candidate.

"As it is the purpose of the committee to endeavour to encourage candidates with special qualifications for careful, methodical work, combined with ability to state a problem clearly and to analyse and interpret data, greater weight will be attached to the possession of these qualifications than to the nature or importance of the problem chosen for investigation.

"Applications, marked 'Social Science Research,' should be made before September 1, 1928, to the secretary to the committee, Mr. C. E. R. Sherrington, M.C., M.A., Byways, Queen's-road, Belmont, Surrey, who will be pleased to give any further information desired."

VIII

HUMAN NATURE IN STATISTICS

VIII

HUMAN NATURE IN STATISTICS[1]

I

I SOMETIMES think that statisticians do not deserve quite all the hard things that are said about them. They are supposed to be cold, unemotional, bloodless and steely-eyed. But, as a matter of fact, we are all statisticians nowadays. We are either forming opinions on other people's statistics, whether we like it or not, or we are providing the raw material of statistics. We fill up Census papers and travel in railway trains with tickets that are the raw material of blue-books. Every time that we die or get married or have babies we get into some statistical mill or other, and our height and our health and our habits, and almost our hopes, are raw material for politicians, economists and tap-room orators. The people who are most ready to condemn statistics—"you can prove anything by figures"—are usually the first to fly to them to prove a point or make a case, and in this hurried and panicky approach they very rarely give sufficient care to the material they are using—no care at all to the logical methods of inference—and thus they get badly let down. So that in the well-known extension to the superlative of "lies" and "damn lies," statistics and expert witnesses are the only rivals. Most of you would as soon be told that you are cross-eyed or knock-kneed as that you are destined to be a statistician, and when you look at the forbidding aspect of the University courses in statistics compared with the genial and homely welcomes extended to you by its brothers and sisters in the family of economics under this roof, you will probably shun even a

[1] Presidential Address to the Students Union, London School of Economics, October 1927.

passing dance with the ugly sister. But I am here to-night to tell you that she is really Cinderella !

In former times, of course, a statistician was merely an arithmetician, and he was quite happy with the first four rules. You can see the great advance in the title if you examine the volumes of the Royal Statistical Society of nearly a hundred years ago and now. Then you merely had tables with totals, averages and percentages; now you have coefficients of all kinds, harmonics, correlations and logarithmic graphs. But these, after all, are only vestments to dignify and command respect—the real man is inside, as before.

Whether you like it or not, statistics must dominate civilised life in the future as never before, and that domination is in three distinct directions: first, we are entering upon a second stage of democracy when we have to rise above the intellectualist fallacy of the nineteenth century which assumed that every voter can give a wise decision upon every public question involving the far reaches of space and time. We know now that most of the main avenues to a reasoned opinion upon vast subjects must be statistical. We can only have a limited picture of reality within reach of our own senses; someone has to supply the complete view.

"In putting together our public opinions, not only do we have to picture more space than we can see with our eyes, and more time than we can feel, more actions, more things than we can ever count, or vividly imagine. We have to summarise and generalise. We have to pick out samples, and treat them as typical." [1]

We have to know the size of the problem, such as the number of the unemployed. We have to know its relation to others, such as a comparison of that figure with the total population, or a comparison with the similar figures in other lands. We have to know its rate of movement—whether it is getting more or less, absolutely and relatively. We inquire into questions of causation and connection with other social phenomena. In many instances where practical

[1] Walter Lippmann, "Public Opinion."

treatment of a problem requires a detailed knowledge and is unmanageable in the aggregate, we have to strive to find types and samples, and this leads us into the science of sampling.

"Some time ago a group of social workers in Sheffield, England, started out to substitute an accurate picture of the mental equipment of the workers of that city for the impressionistic one they had. They wished to say, with some decent grounds for saying it, how the workers of Sheffield were equipped. They found, as we all find the moment we refuse to let our first notion prevail, that they were beset with complications. Of the test they employed, nothing need be said here except that it was a large questionnaire. For the sake of the illustration, assume that the questions were a fair test of mental equipment for English city life. Theoretically, then, those questions should have been put to every member of the working class. But it is not so easy to know who are the working class. However, assume again that the census knows how to classify them. Then there were roughly 104,000 men and 107,000 women who ought to have been questioned. They possessed the answers which would justify or refute the casual phrase about the 'ignorant workers' or the 'intelligent workers.' But nobody would think of questioning the whole two hundred thousand.

"So the social workers consulted an eminent statistician, Professor Bowley. He advised them that not less than 408 men and 408 women would prove to be a fair sample. According to mathematical calculation this number would not show a greater deviation from the average than 1 in 22. They had, therefore, to question at least 816 people before they would pretend to talk about the average working man. But which 816 people should they approach?" [1]

In the second place, statistics are becoming a main engine of business management and the control of industry. The efficiency of various types of machinery and organisation—that is to say, quantitative production and waste—the money costs in different circumstances and in different places, are all essential features in deciding whether to consolidate, to divide, to multiply—are indeed the symptoms of the health of the industrial organism.

In the third place, statistical investigation and verification are in the future to be one of the chief methods of economic discovery and the advancement of economic

[1] Walter Lippmann, *op. cit.*

science. You cannot escape the statistical method, so you may as well make friends with it. You think it is cold and inhuman and impersonal, but, as a matter of fact, it is fuller of red blood and human nature than half the descriptive literature in the world. I agree that you need to be cool and impersonal in handling statistical problems; that is a goal towards which we must constantly strive. It is so nice to coax 2 and 2 to make 4·1545 when we want them to, but intellectual integrity in statistics ought really to have no more privacy than a gold-fish! Statistics are full of human nature and of the personal equation; and you always make allowances for the personal element in your family or sweetheart, even your lecturer, and sometimes yourself. But, of course, in the last case, we are all prone to the mental attitude of the fond mother, who, seeing the troops march past, exclaimed: "They are all out of step except our Jock!"

I want to discuss human nature in statistics in three directions: first, in the person who provides the material; second, in the person who makes it up for use as statistics, and third, in the person who uses it.

First let us look at the provider or source of statistics. If you are going to lean very heavily upon certain statistical data, always inquire, if you can, what they, in the first instance, rest upon; what degree of intelligence there was, brought towards the task, and what interest there was taken in it. In the second place, did providing the details have any effect upon the provider's personal feelings and habits, his desire for secrecy, etc., such as you will get in the revelation of income or of details of family life? Again, were the statistics a by-product of some administrative machine, such as taxation or poor law relief? Or were they gathered *ad hoc* for statistical reasons like a census? Give thought specially where a qualitative judgment or mental estimate has to be given. I have often found amongst unlettered people a great reluctance or inability to give a quantitative mean if the divergences are great. Ask a ferryman or toll-keeper how many visitors come through daily on an average, and with an appearance of great intellectual

discomfort he assures you the number varies so much, "Some days it's a lot, and some days only a few; there isn't exactly an average."

A very good example of the human factor in estimating a subject that is partly quantitative and partly qualitative, is the case of *crop reporting*. You will remember that individuals of particular districts have to report whether a crop is normal, or average, or below average. It was found on examining subsequent results, and comparing actual achievements with the broad effect of these estimates over a period of years, that there was a distinct tendency for the reporters to give an over-sanguine view, in the sense that there were far too many reports of crops being above the average to fit the facts. This may have been due partly to the report upon the crops being given too early for all the risks, to which they were to be subsequently subjected, to be visualised—bad weather, drought, disease and pests, which would thin down a promising estimate—or it may have been due to an artificially fostered idea of what was average or normal by definition. Anyhow, you will find the matter gone into in a paper in the *Royal Statistical Journal* some years ago. I am reminded very much of the picture in *Punch* of the two old fellows sitting over their beer discussing the eternal subject of women, when one of them concluded sententiously, "You know, Bill, it is my belief there ain't more than one average woman in fifty!" Doubtless he expressed a great truth in an unstatistical form. If he meant, as he probably did, that all the women of his acquaintance were above the average, he shared our common experience! If, on the other hand, he meant that they were all either extremely good or extremely bad, like the young lady in the poem who "when she was good she was very very good, and when she was bad she was horrid," then in that case his statement lacked statistical precision! If he had attended the course of lectures under Dr. Bowley, he would have expressed himself as follows:

"You should understand, my dear William, that it is my considered conclusion, after investigating all the facts,

that the frequency distribution of the mental, physical and moral qualities of the female sex displays very marked bi-modal tendencies in such wise that the arithmetical average for all purposes of statistical prediction must be abandoned in favour of the upper and lower modal constants; indeed it would be incorrect and misleading to refer at all either to the median or the arithmetical average if one did not state at the same time that the standard deviation was extraordinarily high for this class of phenomena."

To which Bill would probably reply "Oh lor!"

The tendency of the crop reporters to which I refer differs rather from what is found in the ordinary course of business affairs. There is a tendency—following the poet's declaration that "Man never is, but always, to *be*, blest"—for business men not to admit that times are as good as they really are. At any rate, they have to be very good indeed before they will allow that they are "middling," and they hardly ever recognise a boom until they have got through it! They tend to regard the best times as those which ought to be normal, and anything less than the best is looked upon as a time of depression until actual depression sets in, when they look back on that same period as something to be hoped for once more. I think all of you who are golfers will sympathise with this feeling! When we do a particularly good round—or for those of us who never do a good round, a particularly good hole—we say to ourselves, "Now, *that* is my true game," and we nurse the fond delusion that these high spots on our golfing experience represent what, but for bad luck, weather, lack of practice or some other cussedness, we should invariably reach.

The individual source of the statistics may easily be the weakest link. Harold Cox tells a story of his life as a young man in India. He quoted some statistics to a Judge, an Englishman, and a very good fellow. His friend said, "Cox, when you are a bit older, you will not quote Indian statistics with that assurance. The Government are very keen on amassing statistics—they collect them, add them, raise them to the nth power, take the cube root and prepare

wonderful diagrams. But what you must never forget is that every one of those figures comes in the first instance from the *chowty dar* (village watchman), who just puts down what he damn pleases."

Now let us take some instances of personal interests and feelings being affected. The tendency of ladies to understate their ages is, of course, a well-known phenomenon. If one assumes the number of girls aged ten to fifteen to be correctly stated at one census, one is surprised to find at the next census ten years later that the number of ladies aged twenty to twenty-five is greater. The excess cannot be accounted for by the excess of female immigrants of this age over the deaths and emigrants. We can only explain the figures by assuming that the group above twenty-five is depleted in real numbers, many being pushed down into the class below. But depletion in the age twenty-five to thirty-five is masked by the class being "fed" as it were from the class above, thirty-five to forty-five, and so on. Dr. Snow said that "if the prevarication diminished with age" we could explain some of the anomalies in the emigration age figures also.[1]

I should not like you to think that in these statistical matters I am attacking the feminine sex unduly! I believe that when the old age pensions were introduced it was found that there were far more men over seventy in certain areas, particularly Ireland, than could be accounted for on any of the available statistics from the Census, and consequently the total cost was considerably more than the estimates which had relied upon these particulars. I have not exact details, but that is my recollection of the matter, and for what it is worth I give it to you as a set-off to what I have said above about the ladies' ages. After all, when the villager has finished the process of discounting his age for divers reasons, and becomes a new object of interest as the oldest inhabitant, his progress towards the centenarian becomes surprisingly accelerated.

In connection with an inquiry into the fertility of marriage, by utilising the Census data, it was found that

[1] *Journal of the Royal Statistical Society*, March 1915.

the determination of the chances of fertility during each of the first ten years of marriage was quite invalidated by the human element, at any rate for the first year, and a natural reluctance to show the facts clearly on the Census paper when there had been pre-nuptial conception. If a child were entered in the Census schedule as seven months old, it was too much to expect that the marriage would be returned as under one year. At the time of the Census in Scotland, it was known that there were 31,307 marriages of under one year's duration from the marriage statistics, but on the Census papers only 16,755 emerged as under a year. This fallacy made the first year's figures meaningless, and the second year tended to be really an average of eighteen months, and so on, and the importance of modifying inferences from the tables became less as the time increased.[1]

The Registrar in Scotland made a special and detailed inquiry to get over the difficulty.[2] He found that 23 per cent. of the returns of duration of marriage were overstated. Of marriages of less than one year's duration only 62 per cent. were correctly reported, or 38 per cent. incorrect. Those from one to two years showed 28 per cent. incorrect; the third year 26 per cent.; diminishing to 19 per cent. in the fifth. It was also found that the error of overstatement was most frequent where the duration was nearing a year's completion; that marriages whose duration was overstated showed larger fertility than those correctly reported. Nearly every ordinary inference from these figures had to be seriously modified—the statistics were heavily loaded with error. The estimate of marriages with prenuptial conceptions was 22 per cent. of those marriages which were not of the full normal duration at the time of the Census.

Dr. Stevenson has examined the same error in English statistics where the durations are overstated "obviously and grossly" for the first year; he says, "Evidently with the object of adapting duration to size of family." He

[1] *Journal of the Royal Statistical Society*, 1911–1912.
[2] "Fertility of Marriage in Scotland," *Journal of the Royal Statistical Society*, 1914.

showed that overstatement was much higher in the earlier ages of the women marrying.

Then we have weaknesses due to the fact that the statistics are not gathered *ad hoc*, but are mere by-products.

Where statistics are thrown up by some function of Government as a by-product, as in the case of statistics of income which are derived from the activities of the taxation authority, it is essential not only to be clear about the legal definitions under which that authority is working, but also to ascertain whether any particular category or class has any practical significance in their work. For example, the *raison d'être* of the work is the yield of revenue. If you have a classification in a field in which no revenue is involved, it is obviously not to anybody's particular interest that this should be *exact*. The question must therefore be continually asked, " Is this item significant in the functions of the department? " If it is not, watch it very closely.

In the statistics of nearly all countries you will find that the number of incomes close to the exemption limit does not confirm to any rational curve. This was so in the earliest income statistics we had of 1801, and I have also found it to be the case in examining the statistics of many countries. Obviously, close to the exemption limit the amount of duty is trifling, and it is often not worth powder and shot to follow it up. Somebody who has an obvious item of income just under the limit, with a less obvious addition which brings it just over the limit, is not traced by the authorities, who hardly lose by the fact either, if the direct expense is considered. Others who have an income just above the exemption limit can give themselves the benefit of any doubt in its computation, or can even wilfully depress it to a figure just below without running any great risk of being attacked for fraud. If they were found out the penalty would be very small and it is unlikely they would be pursued. There is, therefore, for personal and for administrative reasons, a considerable depletion of this class and transfer into the class below; so when you are studying distribution of income it is advisable to cut out the lowest effective class altogether as being non-

significant, partly because of the human factor and partly because of the administrative. A similar, but much less marked, condition attaches to the numbers of incomes falling above and below any abatement limit or privilege limit, where there is a tendency for the distribution to crowd itself just below a point—or, put in another way—for the distribution just above the point to be rather starved. This has been the case in surtax and supertax statistics. I have recalled as an interesting reminiscence,[1] that in 1913, when the supertax statistics were first published, following upon the introduction of that tax, they gave us for the first time an official statement about total incomes over a certain range. I was eager to apply the Pareto rule or formula that I had seen used for other countries, to know how it compared with other figures. I annoyed my colleagues at the Revenue in charge of this administration very much by telling them that they had " missed " over a 1000 payers in the lowest class, £5000 to £10,000, and they thought I should be much more usefully employed in telling them *who* they were ! However, they promptly went and found them, and now you will find the £5000 fraternity " toe " the Pareto line quite nicely. As a matter of fact, it is frequently found that the Pareto test with any such set of income statistics drops off a little at the bottom. When I got to the £5000 point, I thought it ought to have been on the line, but it was not. So on the theory that in fact it really *was* there, I gave the number of missing incomes. You will find this failure to come up to the correct or logical number at the lowest scale is quite a common feature of tax systems with an exemption limit, for reasons which will be clear to anyone with administrative experience.

By the theory of the Pareto line, unmodified by common sense, you would have one person at the top with an infinite income, and an infinite number of people at the bottom with no income ! Therefore, the facts about subsistence level compel the Pareto line, which runs from the top left-hand corner to the bottom right-hand corner, to bend over to the left at the top, so that the one person with the higher

[1] In " Wealth and Taxable Capacity."

income has not an infinite income; and to bend over to the right at the bottom, so that the largest numbers of people have an insignificant but constant income at the minimum. This bending away to the right is essentially a Pareto line to fit the facts of humanity and, indeed, the Pareto line has no significance at all except as an indication of the distribution of incomes in the central classes. But when we come in practice to fit Pareto lines to statistics of incomes derived from taxation sources, we generally find that so far from the bottom class calculation bending away to the right, it falls far short to the left, and this is a mathematical or graphic illustration of the point that I have been making, viz., that statistics derived in this way tend to have no value if the facts which they represent, or the purpose for which they were compiled, has little practical significance.

II

Now let us consider the hearer, or reader, of the statistics, the one who has to use them. One of the chief ways in which statistics can fail to reach their proper home lies in the incapacity of many minds to grasp large numbers. You may remember the lecturer in Astronomy or Physics at a village hall who put forth the idea that in a 100 million years the sun would be extinct and our own world a frozen globe. At the end he invited questions and observations, and a yokel at the back got up and asked anxiously: "Do you mind repeating what you said about the sun drying up?" The lecturer did so. "Oh," exclaimed the yokel, obviously much relieved, "a *hundred* million! I thought you said a million!" It is often convenient in public discussions where the smallest unit is a million, to knock off the millions altogether, and talk of them as though they were digits, if we are making comparisons rather than concerned with absolute magnitudes.

We have ways of abbreviating our statistical conclusions that are a little disconcerting to some minds. You will remember O'Flannigan, who was being questioned on his arrival in the States by the immigration officer:

"Name?"—"Flannigan, Patrick."

"Wife?"—"Bridget."

"Any family?"—"Only three, thank God!"

"Why do you say 'thank God'?"—"Well, they do say as statistics says that every fourth child born is a Chinee!"

The logical fallacies of composition and division are perhaps most easily made in statistical quantities. Certainly what is true of the part is thought to remain true of it still in a very literal sense when it takes its place in a larger whole. The story may be apocryphal, perhaps, of one of those vessels in which, as they are not large enough for the services of a doctor, the captain is called upon to officiate in an emergency. He does so by the aid of a medicine chest and a book descriptive of symptoms and appropriate remedies. On one occasion nearly everybody on board fell ill, and they were duly doctored in this way by the captain. They all got steadily worse, and on reaching port he was very glad to hand them over to the professional exponent of the healing art. On inspection the doctor exclaimed: "What on earth have you been doing to these two people?" The captain handed the book to the doctor, who pointed to number 7 and said, "Can't you see that this is what is the matter with them? You should have given them medicine out of bottle No. 7." "Yes, I know," said the captain, "but I ran out of No. 7, so I gave them some of 3 and 4 added together."

The recipient of statistics often finds that percentages, apparently so simple, are really rather baffling.

I would not refer in detail to the well-known story of the present Chancellor's father, and his inquiry of a Treasury official as to what those d—d dots meant. It has been said that Lord Randolph was pulling someone's leg, but a more circumstantial account of the incident is given by Mr. Henry Higgs in his recent book on Financial Reform.[1]

[1] 'In Mr. Winston Churchill's "Life of Lord Randolph Churchill" he says that shortly after his father became Chancellor of the Exchequer he complained to a clerk who had put some figures before him that they were not clear, and he could not understand them. The clerk said he had done his best, and, pointing to them, explained that he had reduced

We do find, however, that these d—d dots are perplexing to some people. There is the story of the two workers in the north who went to the Mechanics' Institution to listen to a lecture on birth-rates, death-rates and other vital questions. On coming out they compared their impressions. One asked the other if he thoroughly understood it. He said "Yes," that he had grasped all of it except what the lecturer said about that death-rate being 18 point 9. It was the point 9 that bothered him. But his companion said, "Oh, that is quite easy! He meant that every time there were eighteen people died there were nine on the point of dying!"

There is much objection to the use of percentage comparisons when the basic quantities which are not quoted are quite dissimilar in magnitude. "We have lost 50 per cent. of our export trade in locomotives in country X, and only 30 per cent. in country Y," is a most misleading statement if in country Y the previous trade was a hundred locomotives and now it is seventy, whilst two locomotives were formerly sold in country X against one subsequently. One is reminded of the South American Republic that had "increased its war fleet by 50 per cent. in a single year," when further investigation showed that a new torpedo

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them to decimals. "Oh," said Lord Randolph, "I never could make out what those damned dots meant." "Surely," Mr. Winston Churchill says, "this was only to tease." No doubt Mr. Churchill repeated that story exactly as it was told to him, but perhaps out of regard for his filial feelings it has been watered down in the process, and there is no harm in my giving you the story in its true form. A periodical return of revenue received into the Exchequer was laid before Lord Randolph, and his private secretary, Mr. George Gleadowe of the Treasury, was looking over his shoulder, and Lord Randolph expressed satisfaction at the fact that the Customs revenue had increased by 34 per cent. as compared with the corresponding period in the preceding year. Mr. Gleadowe pointed out to him that it was only ·34 per cent. "What difference does that make?" asked Lord Randolph. When it was explained to him, he said, "I have often seen those damned little dots before, but I never knew until now what they meant." I have heard that story many times from the lips of Mr. Gleadowe himself, and he always concluded it by saying: "And yet I am satisfied that Lord Randolph would have made an excellent Chancellor of the Exchequer, *as Chancellors go*." It was, of course, regarded as altogether in Lord Randolph's favour that he was teachable, and did not say he was trying to tease, or to pull the leg of his private secretary, or to test his knowledge—but frankly admitted, what was certainly the fact, that he had no conception before of what a decimal point meant.'

boat had joined a "fleet" of two! Or of the doctor who boasted of 100 per cent. of cures against his rival's 90 per cent., and proved to have had two patients against two hundred.

The remedy for this difficulty is, of course, to give ratios such as 2 to 3, and 70 to 75. It is perhaps going too far to say that in no circumstances should percentages be quoted for quantities in themselves less than 100, although there is something to be said for care in this respect.[1]

Again, averages are not all they seem, and before you plant them on an unsuspecting world, be sure that you know that your hearers or readers grasp what you are driving at; especially is this the case where the average is only an arithmetical one and does not exist in fact as a type. You may remember the famous example of the text-books of the cricketer with an average of fifty. Would you lay odds as he goes to the wicket that he will make fifty or thereabouts? If so you will lose your wager, for he is a man who either gets out in the first over or two, or gets past his nervousness and makes a hundred—he never by any chance makes fifty.

The schoolboy acquainted with his newspaper quite accurately defined an average as "the thing that hens lay eggs on." The use of the "average" as applied to men and women is supposed, of course, to mean a type—the man in the street—and yet wonderful statistical attributes are conferred upon him. Recently *The Times* recorded:

> "The 'average man' has been found at last. The discovery of a being so often considered mythical is one more triumph for the exact sciences, since it was chiefly by the potent help of arithmetic that he was lassoed and brought down. The specimen taken is *homo americanus*. This is only just, for few peoples but the American would have shown the sustained ardour necessary to hunt him down. The method, in the hands of the sociological expert of a popular American magazine, found the average State in the Union by dividing the population by the States. Iowa proved to be in the middle, statistically as well

[1] "Business Statistics," Sir J. C. Stamp and C. H. Nelson.

as geographically, and the same process gave Fort Madison as the average town of Iowa. It only remained to find the average citizen; his neighbours elected him by vote, and he is now on view in Chicago. He has been immediately and exhaustively questioned, and with cheering results. There has been much rejoicing over his declaration that he always turns first to the advertisements when reading magazines. Advertisements, he says, 'keeps him in touch with the latest inventions.' His average simplicity saves him from being suspected of meaning by inventions the advertisements themselves and not the things advertised. That is perhaps the most important thing he has had to say. But he has also reassured the Press by declaring that he reads first about disasters and 'unusual crimes,' does not care about foreign news, and has not heard of Locarno. He does not believe that Dempsey will regain the heavy-weight boxing championship.

"Politicians robbed of their habitual perorations by his naïve utterances will seek revenge, and plot to deprive him of his averageness. For he will have trouble in preserving that priceless asset. Is he average for life, or only for four years without re-election? Has the son of the average man a presumptive claim to succeed him? Will the Supreme Court give a ruling or a constitutional amendment guarantee his status? There are difficulties in making his tenure secure, for it would embarrass any country if their average man were to develop eccentricities. But if he is to rely, not on legal but on scientific status, his day of glory will be short. Populations shift quickly in the States, and towns go up and down the statistical tables like elevators. Fort Madison, Iowa, is not a lasting foundation. The publicity and excitement may also change him. It is, in fact, already doubtful if he is still as average as he was."

You have to coax the general reader gradually to appreciate the distinction between the average and the mode, or to get some idea of the importance of dispersion round the average. Be careful, too, how you add averages together. If you had sixty apples, would you rather sell them at five for twopence, or thirty of them at two a penny and thirty at three a penny?

It would seem at first sight that if you take a number of averages each showing a percentage increase on its corresponding item for a previous year, the average of the sum total of those items must also necessarily show a percentage increase over the average of the previous items. It comes as a shock to find that a decrease in the

averages of the aggregates is possible. Here is an actual case :

Average wagon-load	1922 tons	1925 tons	Increase % of 1922	Decrease % of 1922
General merchandise .	2·86	2·90	1·4	
Coal, coke, etc. . . .	9·04	9·16	1·3	
Other minerals . . .	8·45	8·61	1·9	
	5·52	5·50		0·4

How can this be? It is only necessary for the relative importance of the items to the aggregate in each year (before the averages are struck) to alter, in other words for a change to occur in the nature of the traffic. In fact in such items as average wagon-loads, unless carefully handled, wrong inferences abound. A fall in the average wagon-load, especially if the average wagon capacity is maintained or even increased, looks like inefficient loading or uneconomic work. But a 12-ton wagon may be fully loaded with $2\frac{1}{2}$ tons of empty beer barrels, or 6 cwt. of pottery crates, or 8 tons of loose potatoes, or 3 tons of short deals. So all the wagons might be fully loaded and yet the average wagon-load go down, if the proportion of pig iron carried went down and that of short deals went up.

Again, the average wagon-load, which is a figure derived from the total ton-miles and the total wagon-miles, is not a comparable figure if the length of journey of each class of traffic alters, and the pitfalls for the uninitiated who tries to draw inferences from changes in such composites as ton-miles per engine-hour are legion. Dr. Bowley has done sums in " snow-inches-per-acre-hour," and I have no doubt you students can assess accurately the relative values of the exam-efficiency-per-lecture-minute for different courses in the School.

Some people find graphs difficult; others, who hate figures, will follow with their finger the line of a curve as though it were some holy revelation.

Because of peculiarities in the lines it is well not to place too much reliance upon the comparison which results

from placing side by side two charts, drawn on a different scale. In some cases the conclusion drawn from the comparison might be called correct, but it is advisable also to have the actual figures by which to test the apparent conclusions to be drawn from the graphic statements. If the charts can be reduced to some common measure, as, for instance, percentage above or below the average for the period, the comparison becomes much safer. When the up and down movements are numerous it is possible to engender feelings of either optimism or pessimism in a board of directors or committee merely by the way in which the graph is spaced out, and the consequent *acuteness* of the angles which indicate the changes in direction. It is not a bad rule to observe that the spacing should be so arranged that a change which is quite normal or ordinary does not "show up" by an angle sharper than a right angle, and that a more acute angle, which has an unconscious psychological effect, should be possible only when the change is really out of the ordinary.

It is also to be noted that whether the base line is printed or not it is quite possible, by a conscious or unconscious manipulation of the chart, to convey very different impressions. If, for example, we desire to create the impression of regularity, we have only to widen the distance between the vertical lines representing periods of time or to narrow the distance between the horizontal lines representing the amounts or values. In the contrary case, if we wish to give an impression of irregularity, we may narrow the distance between the vertical lines and increase that between the horizontal lines.

There was a Bishop out in China who had to compile returns of the number of converts. He made a graph showing the number compared with the population of China, and it did not appear to show much effect until he had the brilliant idea to convert each line into logarithms.

There are, of course, peculiar perils where highly technical statistics are being used by non-technicians, as I have indicated in the railway figures above.

In a recent lecture by a railwayman to railwaymen, it was

said that the average wagon movement was only 10½ miles a day, but when we take into consideration the fact that the time factor includes time off the railway, *e.g.* wagons used in collieries for storage, under and awaiting loading and unloading, sorting and shunting, in repair shops, and idle in order to supply peak demands, and also that the mileage run excludes sorting and other non-train movements, some 20 per cent. might be added to the result. The American average of 30·4 miles was contrasted, but since the average length of haul is the principal factor in the calculation, and the U.S.A. figure is 180 and the British 54, and demurrage time is greater here, the comparison is strictly much less unfavourable than might appear. Again, it was said that the wheels were only turning 1¼ out of every 24 hours, which is derived from this 10½ miles per day at an average speed of 8¼ miles per hour. But in this 8¼ result, train *hours* include not only actual train time, but also time spent by a locomotive in steam between trains, so actual train time was less than train hours, and the time that wheels were turning is therefore affected. The American comparison appears to be 2·44 hours. *The Times* comment was: "The average wagon capacity was 10¾ tons, *but* the average load was 5½ tons," as though the two measures were *in pari materia*. As I have shown already, this does not mean necessarily that they were only half full. The L.M.S. Railway have 10,000 wagons every week fully loaded with empty cases at 1½ tons only for each wagon. Moreover, the figure of 5½ is the ton-miles divided by the wagon-miles, and this is deceptive, if the wagon-load journeys differ. The largest wagon-loads move the shortest distances, and on the L.M.S. the average at starting point is over one ton greater. When the average speed is given as 8¼ miles an hour it will be realised that, including so much non-running time, this is not speed in the ordinary sense.

Someone might even deduce that as a wagon moves only 10½ miles a day, and the length of haul is 54 miles, with an average empty haul of 27 miles, the average wagon spends five days in conveying a consignment and running empty. As a matter of fact, one loaded trip in eight days,

including Sundays and holidays, is nearer the mark, of which probably only two are running, and six devoted to loading, unloading and warehousing.

When it is said that the operating ratio has risen from 82 to 87 per cent. as compared with 64 per cent. before the war, the general reader wants to be warned that such ratios rise or fall for many reasons, including increases and reductions in rates and charges, or changes in price levels.

III

Now, in the last place, I have to consider human nature in the statistician himself, the man who compiles from the raw material and prepares for the final user. It is human nature, particularly if he is mathematically inclined, to get on with the figures and their manipulation and refinement, and to produce results, forgetting that the figures represent objective realities and that any misconception about their true nature may invalidate the most skilful work. The statistician may be dealing with all kinds of subjects, vital, medical, financial, scientific or legal. He cannot give himself too much trouble in understanding the nature of the material with which he is going to build his edifice.

Statistics of birth and mortality, one would imagine, deal with plain objective facts on which there could be no dubiety whatever. An individual is either born or not, and death is certain in all senses. Only accurate record is necessary. But extraordinary pitfalls await the unwary who make international comparisons. Statistical or registration methods, and even medical ideas as to what constitutes "still-birth," have differed widely in different countries, and the difficulties have been the subject of special statistical reports and official inquiries. In France three days were allowed for declaration to the Mayor, and children were frequently "presented" as stillborn that died within three days after birth. What a difference this must make to comparisons in statistics of infant mortality! Medical definitions in different countries are widely different; the diversity in the period of gestation after which a foetus

is to be registered as a stillbirth being as early as the fourth and as late as the ninth month; and there are no uniform ideas as to the absence of any prescribed sign of life. The difficulty about registration as stillbirth applied to Belgium, France, Holland and Spain. Having got the facts on uniform lines, the statisticians had to settle in principle whether separate records should be kept, or were necessary. Here three cases had to be provided for:

(*a*) Inquiries relating to comparative fertility in women.
(*b*) Studies in mortality among children who attain to "life"—which is not the same as reaching live birth, and
(*c*) Studies of mortality of children born alive.

Again. Sometimes statistics do not seem to fit, and there is a tendency, quite natural, to coax them or tap them into their place. Beware of special pleading upon unexplained differences.

At a big Goods Station employing many hundreds of men it will be understood that various statistical records must be available for the guidance of the responsible officials. A curious case came under notice on one occasion as follows:

The usual weekly statement of tonnage and expenditure reduced to a "cost per ton" figure was presented. Result—tonnage down, expenditure up, cost per ton "shocking." Procedure—the agent and his experts analyse the tonnage and disclose a reduction in all the cheaply handled traffic, such as barrels of beer, bales of cotton, etc., and an increase in all the miscellaneous tonnage such as small lots of groceries, cases of straw hats, etc., the most expensive in handling. After this sectionising, the weekly return, from being an uncomfortable document, became one of considerable attractiveness.

But it was only to be knocked sideways by the timekeeper suddenly appearing on the scene with an admission that he had made a mistake in his calculations, and instead of an increase in wages and cost per ton, there was, in fact, a decrease under both heads!

In costing statistics, especially, there is a tendency to

analyse *up* to the point where we derive satisfaction and then to stop. How many possible stopping places there are, may be gathered from an illustration by my friend Mr. W. V. Wood :

Interest on Capital employed in manufacturing is not the profit we are seeking and is properly for comparative purposes regarded as an element in the cost. The wages paid to a bricklayer twenty years ago for building a wall in the factory were charged to Capital Account, and these wages, with the other capital items, are a part of the ultimate cost of all work performed in the factory—measured to each job by the interest and depreciation upon the capital outlay. A man who grows his own Brussels sprouts in his garden or allotment and wishes to ascertain the cost per sprout must follow the same course. In his first year's work he probably buys or makes a wheelbarrow, and its cost is, obviously, not a charge to the first sprout produced. Its use reduces the direct labour cost on each sprout produced, and, in order to apportion it properly to each year's production, he must spread it by means of interest on capital invested and depreciation. The latter will have regard to the residual value of the wheelbarrow, so that when he tires of agriculture the cash which he obtains on selling it to someone just bitten with the craze will, together with his accumulated depreciation, make good his capital outlay and enable him to buy a wireless set or some such luxury.

The Brussels sprout might make a model cost :

Direct Labour—

(Not to include time engaged in talking to the man next door on the depravities of the season, nor time occupied in exhibiting the crop to his admiring family, but to include time engaged in lighting pipe and removing mud from boots.)

(1) Preparing soil.
(2) Buying seeds.
(3) Sowing seeds.
(4) Transplanting and dibbing.
(5) Watering.

(6) Chasing and executing slugs.
(7) Gathering harvest.
(8) Delivering the goods.
(9) Clearing ground.

Materials—

(10) Seeds.
(11) Manure, etc.
(12) Water supply.

Workshop Expenses—

(13) Upkeep and depreciation of wheelbarrow and other plant and tools.

Superintendence—

(14) Obtaining advice of friends and getting advice of wife (scaled down to 0·1 per cent. of actual).
(15) Planning lay-out.
(16) Keeping cost record.

General—

(17) Interest on capital invested in equipment.
(18) Interest on year's outlay until delivery of the goods.
(19) Rent and rates.

N.B.—Profit on sales and income-tax thereon not to be included.

The total divided by the number or weight of the sprouts, according to taste, will show the cost per unit, and, when compared with the price payable to the local greengrocer for similar sprouts in a similar condition (if the grower's wife considers that imaginable) delivered for cash at the same time, the difference will represent the profit or loss as the case may be.

Over a series of years the comparative prices of buying and producing, and each part of the latter, can be diagrammed in various ways, and, suitably coloured, will form an instructive addition to the family archives. But the figures must not be regarded as merely interesting, unless the producer has passed on to another activity; they must be studied

with a view to reducing any element which appears to be growing, or is found to be higher than that of the man in the next garden, who may have invested more capital in a labour-saving device, or had planned his work on better lines and at more expense, but has, thereby, reduced the direct labour charges in a greater extent, and thus cut his total cost. But, someone will say, what of the improvement to the health of the producer? Is not that a credit item in the cost? It may be—or it may be a further debit if he contracts rheumatism—and either should be brought in.

Again, I need hardly point out that such a by-product of an administrative system as the statistics of income can never be properly handled unless the legal definitions and administrative practices are thoroughly understood. If you doubt it, take a glance at my book on "British Incomes and Property," which is a veritable cemetery of statistical inferences bearing the most illustrious names of the nineteenth century—not necessarily their fault, because there was none to guide. The statistician shares the infirmity of scientists in letting the personal equation sometimes run away with him. He may be so seized with the novelty or importance of a new method as to apply it in and out of season and without careful regard to its ultimate validity. Here we are on difficult, almost metaphysical, ground, and we can merely stand by and watch the few chosen combatants fight their esoteric warfare.

We use the Pareto line for getting a picture of the distribution of incomes. It seems to fit remarkably well wherever we have tried it. Indeed, there is almost the majesty of doom about it. Then along comes Dr. Macaulay, and tells us that there is nothing in it whatever; it is merely "the tail-end of a skew curve," and all tail-ends are alike, more or less. In the upshot we may not throw up the Pareto line, particularly as a useful method of interpretation, but we are well guarded in its use. Then, again, when correlating time series which have long-period wave movements and short-period fluctuations about the main trend, due to odds and ends of local and temporary influence, statisticians have invented the method of "differences,"

taking the difference between each item and its predecessor, minus or plus, and correlating that with the corresponding item of difference in the other series. Then they take second differences, *i.e.* the difference between these differences, and even third and fourth differences, in order to eliminate all accidental influence. Along comes Mr. Udny Yule to show that the results that you get are not really distinguishable from the results that would be got from two entirely random series of numbers, between which no one would assert any kind of correlation whatever. The lesson seems to be that in juggling about with numbers, the border line between the natural accidents or their properties as mere numbers and actual causal relationships is either extraordinarily thin or not properly understood. In the same way, the method of harmonic analysis to discover periodicity has been brought under criticism. Sir Wm. Beveridge has applied it, as you know, to wheat prices over the past few centuries, and has got a number of interlacing cycles of varying lengths, with their points of amplitude either coinciding and exaggerating or counteracting and negativing each other. It has been declared by some mathematicians, once again, that on applying harmonic analysis to random series of numbers, the results would not be greatly dissimilar. Again, on all refinements of correlations, particularly with growing time series, there are unknown risks and perils, and Mr. Yule had dealt learnedly with "nonsense correlations," as he graphically calls them. So when you take a complex tool from the mathematical statistician and start using it yourself, don't expect it to do everything for you, or swallow anything it may tell you, without critical inspection and reservation.

In conclusion, like the miserable man whose passion for the lady was such that he could not possibly live *without* her, and who found also that he could not possibly live *with* her, so you are in for trouble either way. If you ignore and despise statistics, you are for ever helpless; while, equally, if you decide to enter Dr. Bowley's precincts, observe the legend, invisibly written over his door, "Abandon hope, all ye who enter here!"

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